Ontario
Waste Management
Corporation

Facilities Development Process

Appendix to the Phase 3 Report

March 1984

APPENDIX FOR THE

OWMC PHASE REPORT

March 1984

THE ONTARIO WASTE MANAGEMENT CORPORATION

Appendix for the OWMC Phase 3 Report

PREFACE

The materials in this appendix volume accompany the OWMC Phase 3 Report, released in March, 1984. The organization of the text and tables mirrors that of the Phase 3 Report, with the supporting technical information for each section of the report segregated for easy reference.

This volume is intended to be used in reference to the Phase 3 Report. Additional, lengthy technical reports detailing the data and methodologies applied in reaching Phase 3 candidate site decisions are being completed, and will be available from OWMC.

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APPENDIX FOR CHAPTER 2
OF THE OWMC PHASE 3 REPORT

March 1984

Introduction

The following lists are referenced in Chapter 2 of the OWMC Phase 3 Report. This appendix contains the following lists:

- OWMC publications;
- locations where OWMC publications are available for reference;
- OWMC's Phase 3 public consultation meetings; and
- detailed questions and answers on facility characteristics.

OWMC PUBLICATIONS

Facilities Development Process Reports and Summaries

OWMC Facilities Development Process: Phase 1 Report. 68 pp. September 1982.

The OWMC Exchange: Phase 1 Summary. Vol. 1, No. 2. 12 pp. September 1982.

OWMC Facilities Development Process: Phase 2 Report. 58 pp. January 1983.

The OWMC Phase 2 Report Summary. 4 pp. January 1983.

OWMC Facilities Development Process: Phase 3 Interim Report. Selection of Candidate Areas. 55 pp. May 1983.

OWMC Phase 3 Interim Report Summary. 16 pp. May 1983.

OWMC Facilities Development Process: Phase 3 Report. 96 pp. Appendix volume, 183 pp. March 1984.

OWMC Phase 3 Report Summary. 20 pp. March 1984.

Technical Reports

Stage 1 Report, Hydrogeological Study South Cayuga Site. Gartner Lee Associates Limited. 85 pp. January 1982.

Waste Quantities Study. Proctor & Redfern Limited, Weston Designers - Consultants and Ontario Research Foundations. 120 pp. September 1982.

Generic Process Technologies Study. Proctor & Redfern Limited and Weston Designers - Consultants. 335 pp. September 1982.

Primary Environmental Information, Part 1, Geological/Hydrogeological Inventory. Gartner Lee Associates Limited. 20 pp. September 1982.

Primary Environmental Information, Part 2, Surface Water Resources. Gartner Lee Associates Limited and Gore & Storrie Limited. 28 pp. September 1982.

Primary Environmental Information, Part 3, Archaeological Resources. Gartner Lee Associates Limited and Museum of Indian Archaeology (London, Ontario). 95 pp. September 1982.

Primary Environmental Information, Part 4, Climatology - Volume 1 (text). Gartner Lee Associates Limited and Ontario Research Foundation. 41 pp. September 1982.

Primary Environmental Information, Part 4, Climatology - Volume 2 (appendix). Gartner Lee Associates Limited and Ontario Research Foundation. 65 pp. September 1982.

Primary Environmental Information, Part 5, Data Base, Environmentally Sensitive Areas. Gartner Lee Associates Limited. 15 pp. September 1982.

Primary Information, Engineering/Infrastructure. Proctor & Redfern Limited. 25 pp. September 1982.

Primary Information, Transportation. Proctor & Redfern Limited. 22 pp. September 1982.

Primary Information, Land Use. Proctor & Redfern Limited. 42 pp. September 1982.

Background Paper on Waste Reduction. Proctor & Redfern Limited and Ontario Research Foundation. 41 pp. September 1982.

Hydrogeologic Considerations for Facilities Siting. Gartner Lee Associates Limited. 17 pp. May 1983.

Interim Report on Priority Study of Zone 1 and 2 Lands - Golden Horseshoe Geological Considerations. Gartner Lee Associates Limited. 24 pp. May 1983.

Atmospheric Dispersion Influences - Golden Horseshoe. Ontario Research Foundation, Proctor & Redfern Limited and Weston Designers-Consultants. 27 pp. May 1983.

Waste Reduction Opportunities Study. Ontario Research Foundation, Proctor & Redfern Limited and Weston Designers - Consultants. 271 pp. May 1983.

Waste Reduction Opportunities Study - Executive Summary. Ontario Research Foundation, Proctor & Redfern Limited and Weston Designers-Consultants. 22 pp. May 1983.

Map Portfolio: Phase 3 Interim Report. Dillon, Gartner Lee Associates Limited, Marshall Macklin Monaghan and Robertson, Merritt & deVries Limited. 10 sheets. May 1982.

Public Consultation

OWMC Seminar on Waste Management: Summary of Proceedings. Niagara-on-the-Lake. 54 pp. January 15-17, 1982.

Background Information OWMC Workshop January 6-7, 1984 - Hamilton, Ontario. 96 pp. December 1983.

Report on OWMC Site Selection Workshop January 6-7, 1984 - Hamilton, Ontario. 58 pp. January 1984.

General Information

The OWMC Exchange. Vol. 1, No. 1. 4 pp. Summer 1982.

The OWMC Exchange. Vol. 1, No. 3. 4 pp. December 1982.

OWMC Exchange - Site Selection Progress Report. Vol. 2, No. 1. 8 pp. November 1983.

OWMC Exchange - Site Selection Update. Vol. 3, No. 1. 8 pp. January 1984.

OWMC - A Crown Agency - Annual Report 1981 - 1982. 18 pp. June 1982.

OWMC - A Crown Agency - Annual Report 1982/83. 14 pp. July 1983.

OWMC Industrial Services & Marketing Information. Information for Industry. OWMC. 10 pp. March 1984.

OWMC Phase 2 Public Consultation Report. January 1983.

Volume 1: Program Background.
Public Consultation.
Appendix 1: Phase 2 Presentation Visuals.
Appendix 2: Waste Quantities Task Force.

Volume 2: Appendix 3: Documentation of Phase 2 Media Coverage.

Volume 3: Appendix 4: Regional Meeting Notification.
Appendix 5: Exchange.
Appendix 6: Provincial Network Meeting Proceedings.

Volume 4: Appendix 7: Regional Meeting Proceedings.

(A & B) Appendix 8: Phase 2 Written Submissions.

OWMC Seminar on Waste Management: Summary of Proceedings. Niagara-on-the-Lake. 61 pp. February 13-15, 1983.

OWMC Phase 3 Interim Public Consultation Report. May 1983.

Volume 1: Program Background.
Public Consultation.
Appendix 1: Documentation of Media Coverage.

Volume 2: Appendix 2: News Releases.
Appendix 3: Phase 3A Presentation Visuals.
Appendix 4: Regional Meeting Notification.
Appendix 5: Phase 2 Report Summary.

Volume 3: Appendix 6: Provincial Network Meetings.
Appendix 7: Regional Meeting Proceedings.

Volume 4: Appendix 8: Niagara Seminar Report.
Appendix 9: List of Supplemental Meetings.
Appendix 10: Phase 3A Written Submissions.
Appendix 11: Information Deposit Libraries.

Background Paper: Ontario Industrial Waste Management Community Seminars. 492 pp. June-July, 1983.

OWMC Seminar on Waste Management: Summary of Proceedings. Port Colborne. 65 pp. June 17-18, 1983.

OWMC Seminar on Waste Management: Summary of Proceedings. Brantford. 68 pp. June 24-25, 1983.

OWMC Seminar on Waste Management: Summary of Proceedings. Burlington. 63 pp. July 8-9, 1983.

Locations where OWMC Information is Deposited

The Phase 3 Report will be placed on deposit in the following locations:

A) Government Libraries

1. Ministry of the Environment
   Departmental Library
   135 St. Clair Avenue West
   Toronto, Ontario
   M4V 1P5

2. Environment Canada
   Department Library
   Place Vincent Massey
   Hull, Quebec
   K1A 1C7

B) Ontario University Libraries

1. Brock University
   University Library
   St. Catharines, Ontario
   L2S 3A1

2. Carleton University
   University Library
   Ottawa, Ontario
   K1S 5B6

3. University of Guelph
   University Library
   Guelph, Ontario
   N1G 2W1

4. Lakehead University
   University Library
   Thunder Bay, Ontario
   P7B 5E1

5. Laurentian University of Sudbury
   University Library
   Sudbury, Ontario
   P3E 2C6

6. McMaster University
   University Library
   Hamilton, Ontario
   L8S 4L8

7. University of Ottawa
   University Library
   Ottawa, Ontario
   K1N 6N5

8. Queen's University
   University Library
   Kingston, Ontario
   K7L 3N6

9. University of Toronto
   University Library
   Toronto, Ontario
   M5J 2H7

10. Trent University
    University Library
    Peterborough, Ontario
    K9J 7B8

11. University of Waterloo
    University Library
    Waterloo, Ontario
    N2L 3G1

12. University of Western Ontario
    University Library
    London, Ontario
    N6A 3K7

13. Wilfrid Laurier University
    University Library
    Waterloo, Ontario
    N2L 3C5

14. University of Windsor
    University Library
    Windsor, Ontario
    N9B 3P4

15. York University
    University Library
    Toronto, Ontario
    M3J 1P3

C) Regional Libraries

1. Algonquin Regional Library System
   29 Mary Street
   Parry Sound, Ontario
   P2A 1E3

2. Central Ontario Regional Library System
   129 Church Street South
   Richmond Hill, Ontario
   L4C 1W4

3. Chatham Library
   120 Queen Street
   Chatham, Ontario
   N7M 2G6

4. Eastern Ontario Regional Library System
   200 Cooper Street, Suite 6
   Ottawa, Ontario
   K2P 0G1

5. Georgian Bay Regional Library System
   30 Morrow Road
   Barrie, Ontario
   L4N 3V8

   (Removed from information distribution list by request - January 1984)

6. Lake Erie Regional Library System
   380 Saskatoon Street
   London, Ontario
   N5W 4R3

7. Lake Ontario Regional Library System
   88 Wright Crescent
   Kingston, Ontario
   K7L 4T9

8. Metro Toronto Library Board
   789 Yonge Street
   Toronto, Ontario
   M4W 2G8

Locations where OWMC Information is Deposited

9. Midwestern Regional Library System
637 Victoria Street North
Kitchener, Ontario
N2H 5G4

(Removed from information distribution list by request - February, 1984)

10. Niagara Regional Library System
54 Church Street
St. Catharines, Ontario
L2T 7K2

11. North Central Regional Library System
334 Regent Street South
Sudbury, Ontario
P3C 4E2

12. Northeastern Regional Library System
6 Al Wende Avenue
Kirkland Lake, Ontario
P2N 3G9

13. Northwestern Regional Library System
910 Victoria Avenue
Thunder Bay, Ontario
P7C 1B4

14. Sarnia Library
124 Christina Street South
Sarnia, Ontario
N7T 2M6

15. South Central Regional Library System
220 Dundurn Street South
Hamilton, Ontario
L8P 4K7

16. Southwestern Regional Library System
660 Ouellette Avenue
Suite 216
Windsor, Ontario
N9A 1C1

(Removed from information distribution list by request - February, 1984)

17. Waterloo Regional Library System
Marsland Centre
7th Floor, 20 Erb Street West
Waterloo, Ontario
N2J 4G7

D) Additional Candidate Site and Vicinity Libraries

1. Brampton Public Library Board
65 Queen Street East
Brampton, Ontario
L6W 3L6

2. Burlington Public Library Board
2331 New Street
Burlington, Ontario
L7R 1J4

3. Halton Hills Public Library Board
9 Church Street
Georgetown, Ontario
L7G 2A3

4. Lincoln Public Library Board
10 Church Street
P.O. Box 460
Beamsville, Ontario
L0R 1B0

5. Milton Public Library Board
45 Bruce Street
Milton, Ontario
L9T 2L5

6. Mississauga Public Library Board
1350 Burnhamthorpe Road East
Mississauga, Ontario
L4Y 3V9

7. Niagara Falls Public Library Board
4848 Victoria Avenue
Niagara Falls, Ontario
L2E 4C5

8. Oakville Public Library Board
120 Navy Street
Oakville, Ontario
L6J 2Z4

9. Pelham Public Library Board
P.O. Box 830
Fonthill, Ontario
L0S 1E0

10. Port Colborne Public Library Board
310 King Street
Port Colborne, Ontario
L3K 4H1

(Receive limited information only by request - February, 1984)

11. Thorold Public Library Board
1 Ormond Street South
Thorold, Ontario
L2V 1X9

12. Wainfleet Twp. Public Library Board
19M9 Park Street
Wainfleet, Ontario
L0S 1V0

13. Welland Public Library Board
140 King Street
Welland, Ontario
L3B 3J3

14. West Lincoln Twp. Public Library Board
P.O. Box 164
Smithville, Ontario
L0R 2A0

QUESTIONS AND ANSWERS ON FACILITY CHARACTERISTICS

March 1984

The following text was prepared and sent to participants as part of the background information for the OWMC Site Selection Workshop held in Hamilton, Ontario in January 1984.

1.0 Process and Site Characteristics

1.1 How will the facility be powered?

Primary power will be electric.

1.2 What kind of wastes will go to this facility?

For the physical/chemical plant the wastes will be mostly inorganic in nature. Some emulsions (containing organics) will also go to the facility, for emulsion breaking and separation.

Examples of types of wastes for the physical/chemical treatment plant are:

- acid wastes
- spent pickle liquor
- neutral wastes
- basic wastes
- chromium wastes
- sulphide wastes
- oily emulsion
- cyanide wastes
- latex wastes

The incineration plant will receive organic wastes.

Examples of types of wastes for the incineration plant are:

- organic sludges and still bottoms
- solvents and organic solutions
- oils and greases
- oils/water mixtures
- organic and oil residuals
- miscellaneous chemicals and products
- paint and organic residuals
- pesticide and herbicide wastes

A more detailed listing of special wastes is contained in Appendix A of OWMC's Phase 1 and 2 reports.

1.3 How and in what form will the wastes arrive at the facility?

It is anticipated that the main transportation mode will be trucks; however, rail cannot be ruled out at this time.

In their most common form, the wastes will be liquid, solid or pasty.

The bulk of the waste material is expected to be received by tanker trucks.

Some material will arrive in 200 L barrels (steel or other material) while small containers of various shapes and sizes will make up a small proportion of the waste being received.

As was observed at some facilities in Europe, material for incineration can arrive in large horizontal drum-type containers (3,000 L to 8,000 L), unloaded at the rotary kiln where connections for this type of feeding (by vacuum) have been provided. The contents are then discharged directly into the incineration liquid feed system.

1.4 What are the types of physical/chemical treatments?

The treatments can be divided into physical treatments and chemical treatments and fixation/stabilization/solidification. A more detailed description of these processes is contained in The Generic Process Technologies study prepared by Proctor & Redfern Limited for OWMC in 1982.

Some examples of physical treatments are:

- ultrafiltration
- solid/liquid separation
- sludge dewatering
- distillation
- sedimentation

Some examples of chemical treatments are:

- neutralization
- lime precipitation
- sulphide precipitation
- arsenic complexing (and precipitation)
- mercury oxidation (and precipitation)
- chromium reduction
- cyanide oxidation
- carbon adsorption

Physical/chemical processes are rarely applied in a single operation, but rather a few individual treatment technologies are incorporated together to provide adequate waste management. A common example of combined chemical treatment operations is shown as Figure 1.4 (following page). This figure presents a schematic of a chemical treatment operation for aqueous

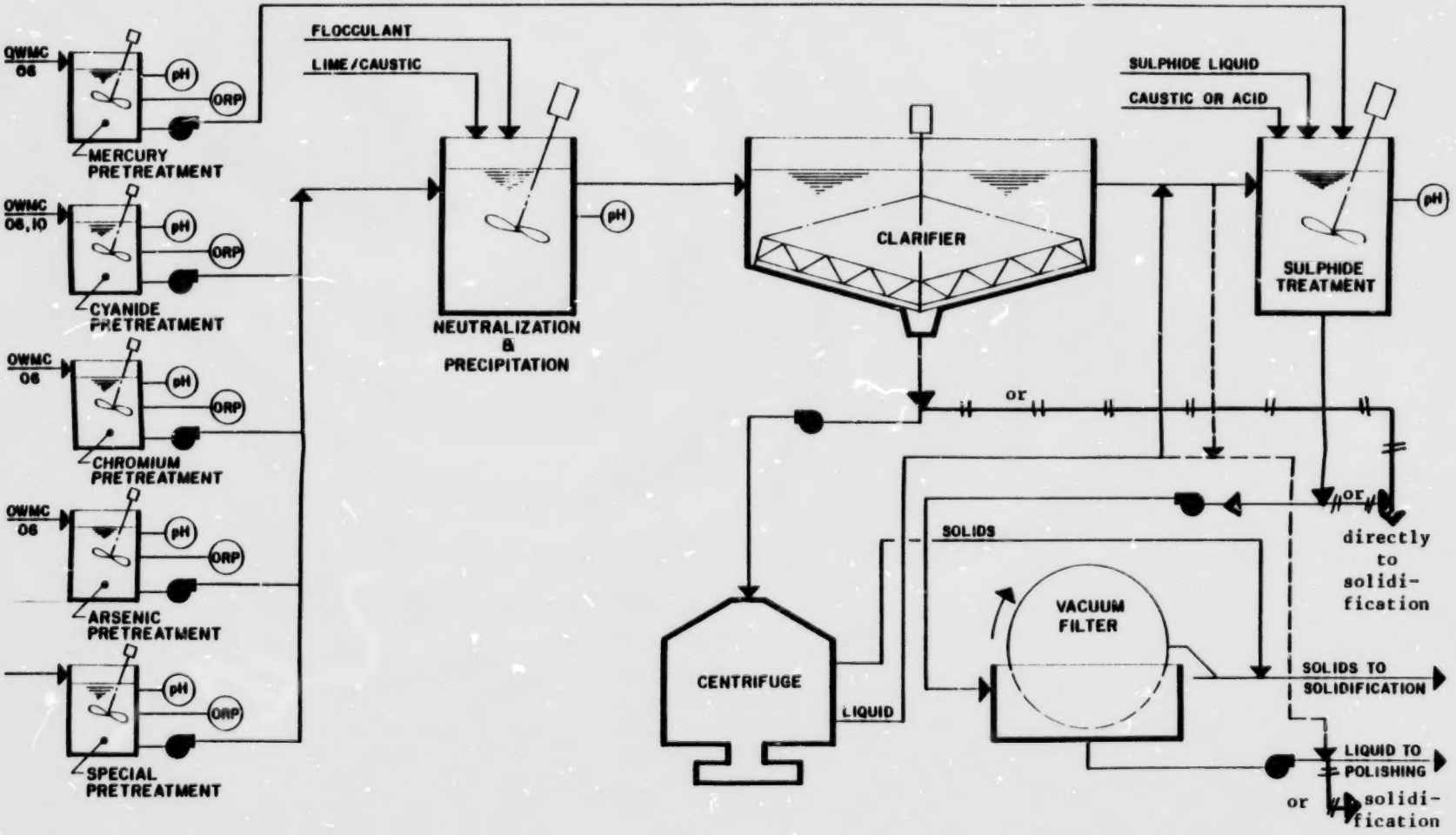


FIGURE 1.4

METAL TREATMENT TRAIN FIG 6

Source: M.M. Dillon
Preliminary Design Study
Physical/Chemical Treatment Facilities
June 1983, Inserts

⫽⫽⫽⫽ - Modified by E. H. Schmidt to show solidification

solutions containing heavy metals (mercury and hexavalent chromium) and cyanide. It depicts the successful integration of various unit operations (e.g., oxidation/reduction, precipitation, clarification, etc.) for treating varied waste streams.

Source: OWMC, "Generic Process Technologies" Proctor & Redfern, August 1982 Chapter 3.3

Fixation/Stabilization/Solidification treatments are tailored to the waste types, an analysis of which is a first step.

As pointed out by Messrs. Colussi and Mullen, "each stabilization process is unique, develops different properties in the stabilized material and uses different mechanisms to protect the environment. A stabilization process is a system and the material cannot be evaluated in isolation from the method of placement and disposal" (p. 1). They state further that "stabilization processes differ and utilize different mechanisms for the containment of contaminants" (p. 1). The purpose of a stabilization process must be "to develop physical properties that, when utilized in a proper setting, will prevent permeation to the ground water, control runoff and protect the environment for an indefinite period" (p. 3).

Source: Conversion Systems, Inc., "The Theory and Design of Structural Landfill as applied to Stabilized Hazardous Wastes" John J. Colussi, Hugh Mullen, November, 1983

1.5 Is solidification a part of this treatment?

° It is OWMC's assessment that some form of solidification must be incorporated into the treatment process. The term solidification can be used to define collectively disposal technologies that stabilize, fix, encapsulate waste in a solid matrix end-product. Whenever solidification is discussed in this document it also refers to fixation and stabilization.

Waste (including its residue from pre-treatment) can be stabilized, fixed or encapsulated.

Fixation techniques chemically and physically bind the waste with solidification agent. Encapsulation methods physically surround the waste within the agent. Both techniques reduce waste permeability.

Source: Chemical Engineering, August 13, 1979

° Stabilization process is designed to treat waste in some manner to lower leachability - this process does not necessarily include fixation.

Most common fixation processes are cement-based, silicate-based and lime-based.

The "STABLEX" process, for instance, uses portland cement and fly ash which fixes the metals within an alumino-silicate matrix.

The "CHEMFIX" process is based on the reactions between soluble silicates and silicate setting agents (such as portland cement, lime or gypsum). Metals in the waste are chemically fixed as silicates and hydroxides and are protected from resolubilization by being incorporated in the impermeable matrix.

The "I.U. CONVERSION" process involves the precise mixing of waste products, fly ash and lime-rich materials.

Other solidification processes are thermoplastic-based, organic Polymer-based, encapsulation techniques.

Source: Chemical Engineering, August 13, 1983

° The extent to which OWMC intends to apply solidification in the overall treatment process depends on a variety of factors which must include site-specific data for final decision.

Because each stabilization process is unique as pointed out in Section 1.4, different properties are developed in the stabilized material. One approach is to opt for total solidification of the residues, effluents and storm water (surface run-off). Site specific information will help determine whether this option will be utilized.

Partial solidification is another viable option if discharge of some effluents and storm water can easily be done.

Technical aspects will play an important role in the evaluation process. The impact of economics and transportation will be especially relevant, because of the fact that the inert material needed for solidification has to be transported to the treatment site.

1.6 Where will the solidified material go?

OWMC is planning to deposit the solidified material into OWMC's engineered landfill or an acceptable alternative.

An acceptable alternative, for instance, may be the permanent storage in a mined out salt mine if conditions permit. OWMC is currently studying these alternatives to determine their safety and suitability in comparison to an engineered landfill.

1.7 What is left after the physical/chemical treatment? What happens to the residue?

All physical/chemical treatment processes generate an effluent and a residual sludge or concentrated waste. The treated effluent (the product of the treatment operation) may be discharged to municipal sewers, or used as makeup water in scrubbers. The residual sludges and the concentrated liquid wastes may require further treatment (e.g., incineration, solidification/stabilization) prior to ultimate disposal in an engineered landfill.

- Neutralization, for instance, produces a treated (neutralized) aqueous effluent and may produce a solid residue. The products of neutralization can be liquid, solid or gaseous. The chemical species present in the neutralized stream may include the original components of the waste stream in addition to material from the neutralizing agent. The concentrations of the individual species will depend on the solubility of the products formed during reaction.

- Chemical oxidation produces an effluent stream containing lower concentrations of the original pollutants as well as a wide range of oxidation products. A precipitated solid residual may also be generated. Depending on environmental regulations, the effluent may be

discharged or given further treatment. Precipitated soiids of course require ultimate disposal if recovery and utilization are not possible.

Chemical oxidations can create a residue requiring ultimate disposal. Depending on the efficiency of the oxidation process, the treated liquid may be discharged or given further treatment as noted under "additional treatment".

- Chemical reduction produces an aqueous effluent and may produce a precipitated solid residue. The effluent often requires neutralization prior to discharge.

  A disadvantage of chemical reduction is that it may introduce new ions into the effluent that might necessitate further treatment as noted under "additional treatment".

Source: OWMC,
"Generic Process Technologies"
Proctor & Redfern, Chapter 3.3
August 1982

In general, liquid effluent streams will require some additional treatment ("polishing") such as:

- chemical oxidation using ozone
- biological oxidation
- carbon adsorption
- ultrafiltration
- reverse osmosis
- electrodialysis

1.8 What is left over at the end of the incineration process?

"Incineration is a versatile process and can also be considered as an energy recovery process if the heat generated is converted into steam and power or is put to some other beneficial use. It can also be considered as a volume reduction process in that many of the component elements of organic materials, including the most common ones, carbon, hydrogen, oxygen, chlorine and sulfur, are wholly or partially converted to gaseous form leaving only the non-combustible inorganic volume. Incineration is also a viable means of detoxifying many materials. If the toxic or otherwise hazardous property is due to the structure of the organic

molecule as opposed to the properties of the elements which it contains, then, in most cases, it is possible to destroy the hazardous property by destroying the organic molecular structure through oxidation or the application of sufficient heat."

To accomplish this the incinerator can be thought of as consisting of four basic components [see Figure 1.8 (following page)]:

- a materials handling system to handle the material so that wastes can be charged to the incinerator in a satisfactory manner.
- incineration components themselves which are the primary combustion chamber (such as a rotary kiln) and secondary combustion chamber (also referred to as the afterburner) used to oxidize the waste material.
- air pollution control equipment which scrub the exhaust gases before emission to the atmosphere.
- water pollution control equipment used to treat scrubber water. (Scrubber water will be treated as part of the physical/chemical treatment process in an integrated facility).

Source: Engineering-Science, "Reference Handbook for Hazardous Waste Management"
Arcadia, California
pp. 13-8, 7-9

In summary, the residues of combustion are slag (at the end of the rotary kiln), fly ash (from flue gas cleaning operation) and blowdown (scrubber water, quench water) and flue gases.

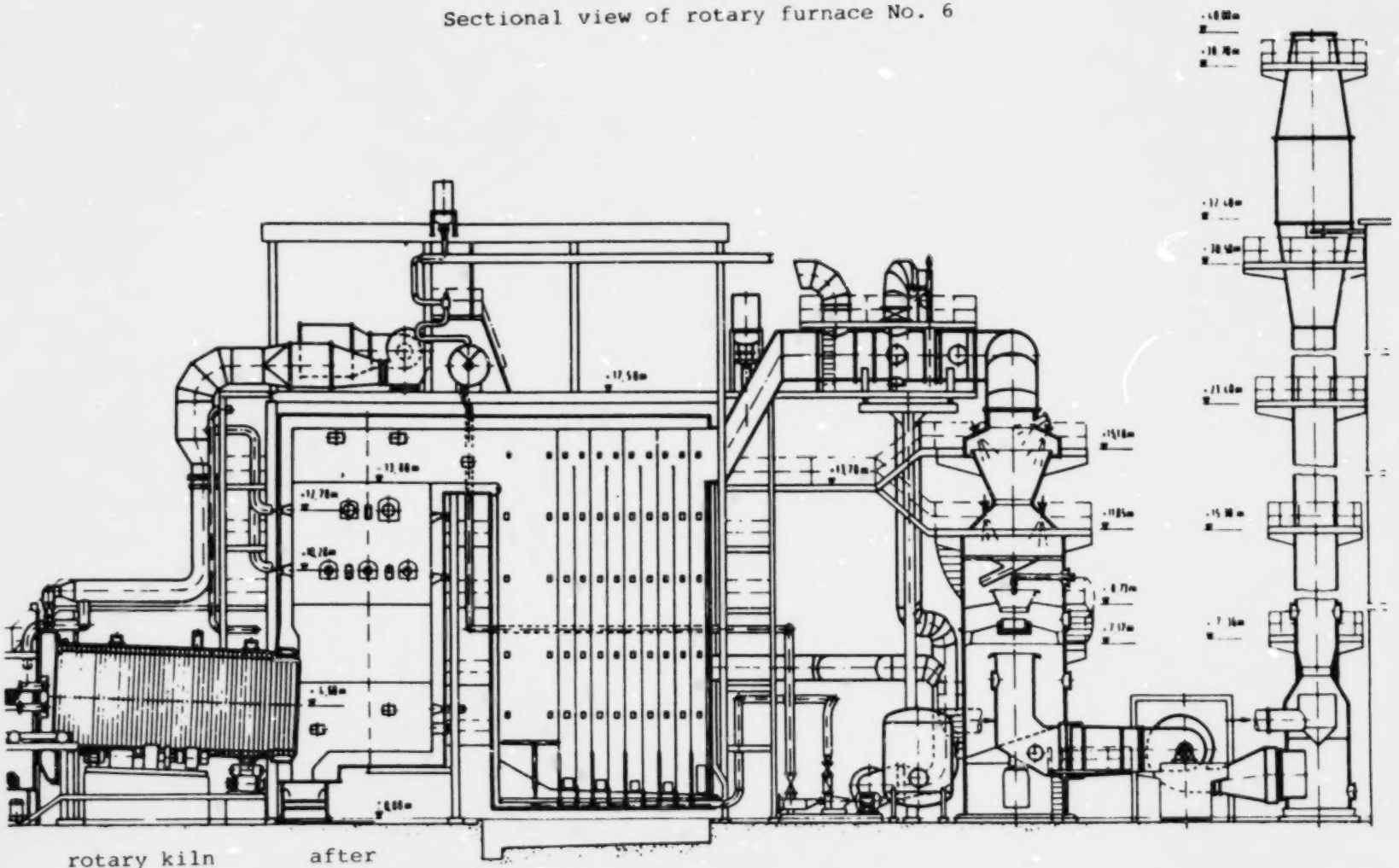
1.9 Is explosion a hazard?

Despite all precautions taken during the design stage, operator error can occur. OWMC is aware of only two explosions which occurred with incineration plants in hazardous waste operation. The most serious one occurred in 1980 at the Bayer A.G. incineration plant NO. II at Leverkusen, Germany due to inadequate procedures, at that time, during unloading of highly volatile waste material. Vapour build-up ignited and the resulting explosion destroyed

FIGURE 1.8

BASF Residue Combustion

Sectional view of rotary furnace No. 6



the bunker building (where waste is stored) and killed a worker. Modifications were made, the waste charging procedures were revamped and better connections provided.

The Kommunekemi plant in Nyborg, Denmark also had an explosion in the rotary kiln in 1982 which did not result in any injury but damaged the equipment. The explosion occurred in the afterburner due to formation of methane gas from waste containing oil and aluminum powder which reacted with water from the water cooling bath.

Safety considerations will be foremost in OWMC's component and equipment evaluation. Operator safety training will also be emphasized at all levels. The incineration plant will incorporate the most up-to-date computerized process control and instrumentation system and the OWMC facility will be designed in accordance with regional health and safety regulations and guidelines.

1.10 How tall will the stack be?

The exact height of the stack cannot be determined until the incineration design process, particularly scrubbing and emission control designs, have been confirmed and a site selected. In Europe, the height of the incinerator stacks ranges from 30 metres to 100 metres.

1.11 Will each type of treatment process be in a separate building?

Most of the physical/chemical treatment processes and the control room will be in one building.

A fixation/stabilization/solidification would likely be integrated into the same building where the other physical/chemical processes take place in an integrated facility.

The incineration plant will be integrated into one continuous unit (not one building per se) from feed end to stack.

1.12 Will there be a buffer zone?

The need for and extent of any buffer zone associated with the facility components will vary greatly depending on the characteristics of the site and surrounding area. The general intention is to acquire a site which is sufficiently large that adequate space is provided beyond the operating area of the facility

component to monitor for accidental releases of contaminants and to take appropriate action to contain any possible spills within the site boundaries. With respect to potential accidental airborne releases the intention is to ensure that any airborne releases are sufficiently dissipated to represent no threat to human health or the environment beyond the site boundary.

The question of whether a somewhat larger buffer will be required beyond that needed for environmental pollution control will depend on local conditions. The site selection process itself should minimize potential conflicts with surrounding uses. However, should a facility be located in non-industrial areas there may be a need to acquire somewhat larger areas to ensure that nearby uses are not affected by such nuisance conditions as noise, odour and visual intrusion. There may also be a need to ensure that new uses are not established in close proximity to the facility which might lead to land use conflicts in the future. An important input into the final determination of buffer and setback requirements will be agency concerns, notably those of the Ministry of the Environment, as well as the concerns and priorities of municipal representatives and local residents.

1.13 How big will it be and what activities will occur there?

Preliminary calculations have resulted in a minimum buffer zone of 400 m around the treatment facility in a non-industrial area. These preliminary calculations have only been employed for the purposes of identifying potential sites. As the number of potential sites is diminished refinements to the buffer size will be made based on more detailed facility characteristics and local condition information.

Studies are currently underway concerning the type of industrial and non-industrial uses which would be appropriate in a buffer zone. In general it is anticipated that non-industrial uses will be limited to low intensity uses. As with the buffer zone and setback requirements the uses to be permitted within the buffer zone will depend, to a considerable extent, upon agency discussions and discussions with municipal officials and local residents.

2.0 Transportation

2.1 What type of vehicles will be going to the facility?

Liquid and solid waste will arrive in different types of vehicles. (See Fig. 2.1 following page)

Transportation Equipment:

Type	Size Range
straight tank	3 600 L to 18 900 L most common size is: 10 800 L to 15 000 L
tank trailers	9 000 L to 40 500 L
lugger trucks	18 000 kg to 30 000 kg
dump trucks	18 000 kg to 30 000 kg

2.2 How many vehicles per day will be going to the facility?

Truck traffic to the facility will include trucks carrying wastes to be treated and good and supplies for the treatment and disposal operations (e.g. fuel, flyash); traffic volume could average 40 trucks per day or more. The exact number of trucks will depend on the waste volumes OWMC expects to be treating and the location of the facilities (centralized or dispersed). An important factor affecting truck volume will also be the type of solidification process utilized. Total solidification could significantly increase truck volume, to supply the process with required raw materials (cement dust).

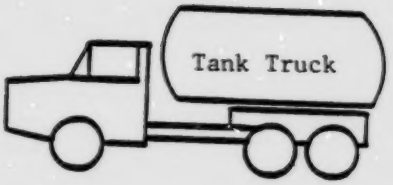
2.3 What type, number and frequency of vehicles will be going to the facility site during construction?

During construction all types of vehicles will go to the facility. Dump trucks, stake trucks, trailers, some tankers, flat beds (for transporting earthmoving equipment and large items), pick-ups, mobile construction equipment (such as mobile cranes, "cherry-pickers," front-end loaders, etc.).

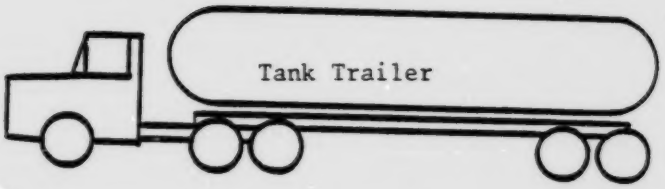
Number and frequency varies entirely with the season, type of work being done (i.e., site preparation is different from building construction or equipment erection) and other requirements consistent with a facility of this size.

Earthmoving equipment, for instance, is transported there and stays there for the duration of the requirements, the same with mobile cranes (although it can vary for special hoisting

Gross Vehicle Weight: 28,300 kg
Carrying Capacity: 18,000 kg
(approximate) (maximum)
about 15,000 litres
or 3,400 gallons



Gross Vehicle Weight: 47,500 kg
Carrying Capacity: 30,000 kg
(approximate) (maximum)
about 25,000 litres
or 5,500 gallons



Gross Vehicle Weight: 28,300 kg to 47,500 kg
Carrying Capacity: 18,000 kg to 30,000 kg
(approximate)

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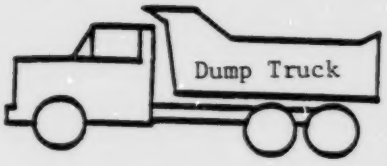


Figure 2.1 Types of Trucks

jobs). Similarly, ready mixed concrete delivery trucks will arrive frequently during pouring of concrete.

2.4 How long will this last?

Total construction time for the facility could take up to two years.

2.5 What measures will be taken to ensure safety?

The Transportation of Dangerous Goods Act, promulgated by Transport Canada, contains several measures applicable to the transportation of liquid industrial wastes.

Under the Act dangerous goods are put into nine classes which are broken into divisions. Division 9.3, for instance, consists of 97 specific waste streams that represent a potential environment or health hazard.

Once the regulations are passed stipulations will be in place for equipment requirements, record keeping, labelling and placarding and other procedures and responsibilities. Placarding is a form of visible identification on the vehicle or container to indicate what the vehicle is transporting. This gives some idea of the kind of cargo carried which will greatly facilitate the implementation of proper emergency measures in case of an accident. Figure 2.5 (following page) exhibits a few examples of the placarding requirements. Most placards have distinctive colours.

Only licensed haulers experienced in transporting "dangerous goods" will be used. Responsibilities of the shipper and the carrier are clearly defined and will be enforced. It is normal procedure for them to inspect their equipment periodically to ensure sound mechanical condition for safe operation. As mentioned before, it is part of the carrier's responsibility to display the contents of what he is carrying prominently on trucks and containers (labelling and placarding procedure).

2.6 Will all drivers be trained?

It is expected that the drivers used by the licensed haulers will be properly trained and only properly trained and licensed drivers, driving vehicles containing necessary safety requirements, will be accepted at OWMC facilities. This is considered a key to safe operation.

FIGURE 2.5

CLASS 4 - FLAMMABLE SOLIDS, SPONTANEOUSLY COMBUSTIBLE, DANGEROUS WHEN WET

Flame Symbol

4.1 Flammable Solids - red and white striped placard

4.2 Spontaneously combustible substances - bottom half red

4.3 Dangerous when wet - blue placard

Hazards

Ignite easily
Burn violently
Air or water reactive - 4.2 or 4.3
Spontaneously combustible - 4.2
Toxic/corrosive (can be)

Common examples:

- sulphur (bulk), a widely used chemical; used in pulp and paper manufacture, rubber processing, sulphuric acid manufacture, oil conditioner, insecticides, dyes, drugs.	4.1
- fish meal, used in cattle and poultry feed, in fertilizers.	4.2
- aluminum alkyls, used in tires, hoses, insulation, food and medical containers, plastics, indoor-outdoor carpeting.	4.2 & 4.3
- calcium carbide, used for generating acetylene gas for welding, fertilizer.	4.3

Source: Transportation of Dangerous Goods
Classes and Identification Marks
Transport Canada Publication, 2931 E

Training will be provided not only in dealing with emergencies but also in making the driver understand the nature of the waste he/she is carrying in order to avoid emergencies and be able to handle the checking, loading and unloading in a safe manner.

The Transportation of Dangerous Goods Act sets out some specifics regarding drivers of trucks. (Example: must be at least 18 years of age, may not leave vehicle unattended, no passengers are permitted to be carried except helpers, etc.)

2.7 Will drivers be OWMC drivers?

OWMC does not expect to enter into the transportation business. The only drivers that OWMC may possibly have are those who drive OWMC owned trucks specifically required for the transportation of residues to a disposal site within an integrated OWMC facility.

3.0 Air Emissions and Effluents

The thermal processing of waste materials produces air emissions, ash, and, in some systems, liquid waste from liquid type air pollution scrubbing systems. All of these must be properly controlled.

In Ontario, the Ministry of the Environment have issued regulations, standards and guidelines to regulate and control air emissions and liquid effluents to assure that the environment is protected when emissions and effluents are released.

The Environmental Protection Act's "Air Pollution Control (General) Regulations" (R.R.O. 1980, Reg. 308) sets out maximum concentration of a contaminant at a point of impingement from a source of contaminant expressed as an "half-hour average concentration".

In addition, the "Ambient Air Quality Criteria Regulation", (R.R.O. 1980, Reg. 296) refers to ambient air criteria and includes all sources of emissions together with the 'background' of the pollutants referred to.

The Air Resources Branch (Ministry of the Environment) has published a "list of tentative standards, guidelines and provisional guidelines for air contaminants" (Jan. 1983) which, in most cases, list the half-hour average standard, the 24-hour ambient air objective and others.

The OWMC facility will be designed and operated so that all applicable regulations, standards, guidelines, etc., are met. Similarly, liquid effluents have to meet the M.O.E. water quality criteria which have been developed.

Regulations, standards and guidelines in other jurisdictions (Europe, U.S.A.) are strictly adhered to by the operations of hazardous waste treatment facilities in these countries.

It must be emphasized that each individual application is examined by the regulator responsible for the safe operation of the facility in that locality to ensure that all applicable regulations are met. In some cases a license to operate will impose more stringent standards based strictly on local conditions with regard

to ambient existing air quality and discharge capability for liquid effluent.

3.1 Air Emission - General Overview

Potential air emission sources from the treatment facility are from several areas:

- Incineration system (major source of emission)
- Physical/chemical treatment
- Other areas:
  - Inorganic waste unloading station
  - Drum storage area
  - Organic waste unloading stations and storage area
  - Truck washing area
  - Solidification additives storage
  - Fugitive emissions (see page 20)

Air emissions from the incinerator are in the form of cleaned flue gases discharged from the stack and require careful monitoring.

There are basically three types of air emissions from an incineration system:

- particulate matter
- combustion products
- uncombusted organic matter.

Particulate matter consists of particles of inorganics and ash which range in size from less than a micron (a human hair is about 100 microns thick) to the size of a large grain of sand. Particulate matter is of concern when burning solid wastes and liquid wastes containing inorganic compounds such as metallics. Particulate matter itself is not typically considered hazardous, but because it has been recognized as a lung irritant and as a possible carrier for uncombusted organics, it is regulated by environmental regulatory agencies.

Combustion products include water vapour, carbon dioxide, nitrogen and sulphur oxides, metallic and non-metallic oxides, and acids depending upon the make-up of the waste being incinerated. Some carbon monoxide is also produced. In a properly operated system, however, the carbon monoxide is almost entirely converted into carbon dioxide.

Water and carbon dioxide are not typically considered pollutants. Nitrogen oxides and sulphur dioxide are presently regulated. While waste incineration is not a significant source of either of these two gases compared to fossil fuel boilers and automobiles, the emissions must still stay within regulations. Sulphur dioxide is normally controlled by scrubbing the off-gas in a caustic scrubber, which can be accomplished with existing scrubber technology. Nitrogen oxides are not as easily controlled as sulphur dioxide. The high temperatures necessary for destroying some hard-to-burn wastes have the side effect of converting the nitrogen in the combustion air into oxides. Nitrogen oxide formation in other sources such as coal fuel boilers is usually controlled by varying combustion conditions. This variation is more difficult to control in hazardous waste incineration and improvements are continuously studied and implemented. Hydrogen chloride gas, produced from the combustion of chlorinated wastes, must be controlled for environmental reasons and to prevent corrosion to scrubber facilities. Such control is possible through the use of caustic scrubbers of either the wet or wet/dry type.

The emission of uncombusted or partially combusted organic matter must be at a minimum because many organic chemicals are either known or suspected carcinogens. Thus, the incineration of material must be complete. High destruction efficiencies are obtained by maintaining proper combustion conditions. These conditions may require an afterburner, or secondary combustion chamber. Although it is very difficult to measure high level destruction efficiencies for low concentrations of contaminants, destruction efficiencies of 99.98% and better have been obtained in several types of facilities.

Source: OWMC, "Generic Process Technologies" Proctor & Redfern, August 1982 Chapter 3.4 (p. 149).

During certain physical/chemical processes gaseous products can be formed which can be hazardous/toxic. Provisions will be made to remove any toxic gases generated through scrubbing or other treatment. For instance, a

neutralization process may produce acid vapours which can be scrubbed out with alkali (usually lime). Some chemical oxidation processes may emit toxic vapours but during chemical reduction process, for instance, air emissions are not expected to be significant.

Source: OWMC Project Group consulted Arthur D. Little report to U.S. EPA 1977 and, Waste Technologies Industries Application document for Ohio Approvals Board, November 17, 1982.

Emissions from other areas can be similarly treated and/or contained.

Fugitive emissions such as leaks from valves, fittings, pumps, originating inside processing buildings will be captured and treated by the exhaust gas system. Those originating from outside are the only potential source of fugitive emissions but quantities are relatively small.

Source: OWMC Project Group. Also consultation of "Analysis of Operation and Emissions from Typical Hazardous Waste Treatment Processes". (pp. 21-42) Bureau of Solid Waste Disposal, Massachusetts Department of Environmental Management, December 1982.

3.2 What will come out of the stack of an incinerator?

The stack emission from the incineration will be cleaned flue gases.

It must be recognized that approximately 99.9% of the flue gases emitted consist of water (15.0% by volume), carbon dioxide (3.8%), oxygen (13.0%), nitrogen (68.1%).

Source: Waste Technologies Industries. "Application to the Ohio Hazardous Waste Facilities Approval Board". Revised November 17, 1982 (Vol. 3, pp. 21-4).

3.3 What chemicals? What form?

The largest weight of emissions from an incinerator will be gases. By far the largest weight of gas will be nitrogen (derived from the air), water vapour (derived from evaporating waste water and burning waste and fuel), carbon dioxide (derived from burning waste and fuel)

and oxygen (derived from the air). These gases are nontoxic, odourless and colourless.

Source: Massachusetts, 1982 (see 3.1).

Emissions of hazardous constituents to the atmosphere are minimized through the use of proper air pollution control systems, sized and matched to the type and quantity of waste to be handled by the facility.

Regulatory agencies have accepted many rotary kiln incinerators as latest state-of-the-art incineration technology when coupled with appropriate air pollution control systems.

Source: OWMC, "Generic Process Technologies" Proctor & Redfern, August 1982, Ch. 3.3

However, the presence of heavy metals in waste is another and highly publicized source of pollution. Many metals evaporate in the flame, either as such or under the form of volatile oxides, chlorides or other salts. When arriving at the cooler part of the plants they condense to form aerosols of submicron particles which are difficult to remove by means of conventional dust collecting equipment.

Source: "Emissions and Pollution Abatement Systems in Incineration Plants for Special Wastes" by Alfons Buekens and Luc Jacobs.
Presented at the "Recycling International" conference in Germany 1982.

The most common heavy metals which may be encountered are cadmium (Cd), lead (Pb), chromium (Cr), copper (Cu), vanadium (V), zinc (Zn).

Additional equipment is normally required for successful separation of aerosols from the flue gas. The HIM facility in Biebesheim, Germany, for example, has provided an additional aerosol separation stage in the wet scrubber to solve this potential problem. This points out that careful selection of the scrubbing equipment is a 'must'.

Source: "Combustion Plant for Industrial Waste and Refuse in Biebesheim" by Günter Erbach, April 1982.

The quality and quantity and, hence, concentration of the cleaned flue gases discharged from the stack are difficult to predict unless details of the waste composition and quantity of each type of waste are known.

Incineration of hazardous waste raises concern over the environmental effects of pollutants in the incineration process. However, available air pollution control equipment will reduce incinerator emissions to meet the regulatory standards.

According to Ontario Regulation 308 "Air Pollution Control (General) Regulations" the concentration of a contaminant at a point of impingement is given in micrograms per cubic metre of air ($\mu g/m^3$) and expressed as a "half-hour average" as a maximum concentration.

A more common expression of concentration as practiced in European jurisdictions is to express the maximum as quantity of contaminants allowable in flue gases discharged from an incinerator stack. This quantity is expressed as milligrams per standard (or normal) cubic metre (i.e., 0°C temperature and 760 mm Hg pressure) referred to a standard concentration of 11% oxygen (in Germany) or that of 7% carbon dioxide (Denmark) or 10% carbon dioxide (Finland, Sweden). The reference to O_2 or CO_2 is important so that no claim can be laid that a contaminant will meet the permitted regulatory concentration by merely diluting with more air.

In the U.S.A. the Resource Conservation and Recovery Act (RCRA) is the first comprehensive federal regulation for protection of public health and the environment as well as conservation of natural resources. The regulations for incineration are published in the Federal Register and limit concentration of contaminants by imposing certain standards to stack emissions. Because of the Regulated Destruction and Removal Efficiency (DRE), for instance, the discharge of organic contaminants is low because 99.99% of "Principal Hazardous Organic Constituents" must be destroyed or removed as required by the applicable performance standard. Analysis of data indicates that, for typical waste feed rates, no significant health hazard will exist with most organic wastes when treated to 99.99% DRE.

Similarly, the emission of particulate matter (including dust) is included in the regulations in Europe and the U.S.A.

Attached as Appendix 1 is a table entitled "Emission Design Standards for Industrial Incineration". Appendix 1 was prepared to illustrate some standards and to show the differences which exist within European countries. Local conditions account for some of the differences.

In addition to concentration the question frequently asked is how much of the gases and "pollutants" leave the incinerator stack; this is frequently expressed in pounds per hour (lb/h), tonnes per year (t/a), kilograms per hour (kg/h) or other units.

In their report, "Analysis of Operation and Emissions from Typical Hazardous Waste Treatment Processes" the Commonwealth of Massachusetts (Department of Environmental Management, Bureau of Solid Waste Disposal) has attempted to estimate the quantity of incinerator stack gas.

To determine the quantity of incinerator stack gas, the size of the incinerator must be known. Size is measured in heat output, and a size of 90 million British thermal units (Btu) per hour is assumed. This is the size expected to be installed in Massachusetts and is similar to what OMWC estimates. A pound of fuel oil yields about 17,500 Btu when burned. Wastes, however, do not have as high a heating value as fuel oil, mostly because they are wet. Waste oil is an excellent fuel, nearly as good as regular fuel oil, but most other wastes have from one-third to one-half the heating value of fuel oil. For estimating purposes we have assumed a heating value of 8,500 Btu/lb. The incinerator will, therefore, handle an average of 90 million/8,500 = 10,600 lb waste per hour (this is equivalent to about 25 drums of liquid waste per hour).

With this information, the major components of the stack gas can be estimated. (For simplicity, chemical calculations which are made in molar units are not given here because they are

not useful for the reader who is not a chemist.) The results are that the major components of the stack gas will be about:

	lb/h	Volume %
Nitrogen	108,000	73.0%
Oxygen	17,000	10.3%
Carbon Dioxide	17,000	7.3%
Water Vapour	9,000	9.2%
Hydrogen Chloride	300	0.2%

The precise composition of the gas depends on the composition of the waste and on the water content of the waste.

We now need to know the quantities of pollutant gases released. Based on a probable mixture of waste that will be burned in an incinerator the release of these gases were estimated. On Table 3.6 are shown the numbers for certain polluting gases and the estimates for the major gases, in ib/h and in tons/year. The total release of stack gas is 56,700 cubic meters per hour based on the foregoing calculations. From this number the concentration of pollutants in the stack gas in milligrams per cubic meter was also calculated.

TABLE 3.6

APPROXIMATE COMPOSITION OF THE STACK GAS FROM A SINGLE, 90 MILLION BTU/HOUR INCINERATOR

	tons/a	lb/h	Concentration in the stack (mg/m^3)
Nitrogen	473,000	108,000	
Carbon Dioxide	74,000	17,000	
Water Vapour	39,000	9,000	
Oxygen	74,000	17,000	
Carbon Monoxide	41*	9	72
Nitrogen Dioxide	70*	16	128
Hydrocarbons	17*	4	32
Sulphur Dioxide	63*	14	112
Hydrogen Chloride	18*	4	32
Particulates	70*	16	128

*Estimated by IT Corporation. All other numbers estimated by others.

To understand the meaning of Table 3.6, the values given must be related to ambient air quality or to release rates from other sources.

As an example of actual results Table 3.7 (following page) has been included to show actual results of an incineration facility in Germany together with German federal air emission standards (TA-LUFT) and standards imposed by the local authorities as part of the permit.

3.6 What will be the impacts of these air emissions?

Air quality standards, guidelines, regulations and others are consulted in order to design a facility so that these types of emissions could not be generated in amounts sufficiently great to result in ambient concentrations in excess of recommended levels.

3.7 How will air emissions be monitored?

There will be continuous monitoring and periodic monitoring. Instrumentation will be incorporated into the control and monitoring system to continuously monitor for, say, particulate emission (dust) in the stack gas, sulphur dioxide (SO_2), carbon monoxide (CO), trace hydrocarbons.

For some components, such as Hydrogen Chloride (HCl), there is no simple method to continuously analyze for HCl. Sampling and batch analysis is required.

Source: "Analysis of Operation and Emissions from Typical Hazardous Waste Treatment Processes", December 1982 Commonwealth of Massachusetts, Department of Environmental Management, Bureau of Solid Waste Disposal.

One important point to be made here is the importance of the "recipe", i.e. the composition of various wastes which are incinerated at any one time in order to control emissions. As an example, if a waste contains a lot of chlorine, another waste is fed into the incinerator containing no chlorine for a "dilution" in order not to overload the scrubbing system.

Source: OWMC Project Group from discussion with operators of similar facilities already in operation.

Table 3.7

HIM Hessische Industriemüll GmbH

Source: Attached to HIM letter dated 18 Oct 82 (Erbach to Chant)

TABLE 3.7

INDUSTRIAL WASTE INCINERATION PLANT BIEBESHEIM, GERMANY

Flue Gas Treatment Plant / Test Results

	limit as per TA-Luft mg/Nm^3	limit as per permit mg/Nm^3	actual as per TUeH Test mg/Nm^3
HCl - Hydrogen Chloride	100	100	15
HF - Hydrogen Fluoride	5	5	0.03
SO_2 - Sulphur Dioxide	no limit	200	100
CO - Carbon Monoxide	50	100	6
C organic - Carbon, organic	50	50	3
NO_x (as NO_2) - Nitrogen Oxides (as Nitrogen Dioxide)	no limit		40
dust total, therein	75	- 75	30
. **dust class II such as**			10
zinc (Zn)	50	15	1.86
cobalt (Co)			0.01
. **dust class I such as**			
arsenic (As)		1	< 0.03
lead (Pb)			1.67
chromium (Cr)			0.05
nickel (Ni)	20	5	0.02
beryllium (Be)		0.1	< 0.02
mercury (Hg)			0.006
cadmium (Cd)		0.16	0.09

mg = milligrams

Nm^3 = normal cubic metre (i.e., at standard temperature of 0°C and pressure at 760mm mercury.

3.8 Who will set standards for air emissions?

In Ontario, the Ministry of the Environment and their Air Resources Branch set standards for air emissions.

Concern for air pollution is seen as being associated with industrial and population density. Thus, air pollution has often been defined as the presence, in the atmosphere, of substances resulting from man-made activities in quantities and concentrations which are injurious to human, animal, or plant life, or deleterious to property.

This line of reasoning leads to the consideration of airborne materials in terms of concentration and time, since any quantification of physical, chemical or physiological phenomena is normally described in this way. As a corollary the concept of time-concentration requires that we have or derive adequate means of measurement. In these terms air pollution control, therefore, can be said to be comprised of two major components; namely, the setting of agreed upon ambient air objectives (in terms of time-concentration of the components of the atmosphere) and then the devising of a mechanism to control air effluent sources such that the air quality objectives will be achieved.

In Ontario, air quality objectives are based on the examination of all known effects of each contaminant and are in terms of time-concentration values which are below a known significant adverse effect.

Because ambient air quality is the combined result of source emissions and wind movement (air transport), the source emission standards are stated in terms of time-concentration at the nearest significant receptor; the standards are called point of impingement standards and are stated in micrograms per cubic metre of air, as a half hour average concentration. The contaminant concentration at the source (point of emission) is related to the point of impingement (i.e. to the concentration at the nearest receptor) through the use of equations specified by regulation. Thus, Ontario's source emission standards are related to the ambient air quality, and by their nature place a specific emission constraint on each individual source,

since the codified equations take into consideration local land use and topography. The point of impingement standards (source emission standards) are published in one regulation (O. Reg. 308), "Air Pollution Control (General) Regulations" and the "Ambient Air Quality" criteria are given in a separate regulation (O. Reg. 296); together these two regulations constitute the general air regulations which apply to all situations in Ontario.

In addition to contaminant criteria and standards there are contaminant guidelines which are published by MOE (but not Gazetted) to cover those situations where insufficient data is known about the effects of a contaminant to warrant producing an official regulation. To date, there are some 165 contaminants for which there are criteria and standards or guidelines.

The legislation also provides authority to make regulations for special situations. These regulations may be specific as to time or place, e.g. Sulphur in Fuel in Toronto, SO_2 in Sarnia, INCO, Ontario Hydro and Ferrous Foundries.

Standards and guidelines are used by the Ministry in the assessment and approval of construction emitting air contaminants.

Source: Review of "Development and Rationale for Air Pollution Criteria and Standards", Air Resources Branch, and "The Rationale, Methodology and Administration Used in Ontario to Determine Ambient Air Objectives and Emission Standards", by Martin and Kupa (Air Resources Branch).

3.9 Will there be aqueous effluent?

Yes. All treatment processes produce an aqueous effluent. The proper handling of this effluent is an important part of the overall treatment processes and management thereof.

Liquid effluents from the flue gas cleaning system at the end of the incineration process come from the packed bed flue gas scrubbers and water for ash quenching. This liquid effluent is generally acidic or alkaline and may contain high concentrations of salts or other inorganics. These liquid effluents must be

properly treated and disposed or discharged. The technology for achieving such treatment is usually incorporated as an integral part of hazardous waste treatment facilities.

Treatment of these effluents may include neutralization, metal precipitation, clarification, filtration, and clarifier sludge dewatering.

Waste water from the physical/chemical treatment plant will be collected in flow equalization basins. This waste water may be "polished" (if required). Selecting the type of process most suitable (some of which are described in Section 1.5, page 5).

In addition, management of waste water will include effluents from the sanitary system, truck wash, storm water and some miscellaneous sources.

Proper management of the waste water activity will ensure that a specified level of waste water quality be achieved. Furthermore, the discharge waste water quality standards are based on the utilization of well demonstrated technology and on the performance of existing waste and waste water treatment facilities in Canada, the United States and Europe, which use similar technology.

Solidification/Stabilization/Fixation of all acqueous effluents (excluding discharges to sanitary sewer) is also a consideration if site conditions are such that discharges to a lake or water pollution control plant are not possible. Details of solidification are given in Section 1.6, page 6.

Proper management also includes segregation of waste water from specified areas. For instance, storm water can easily be collected separately and segregated from effluent originating at the physical/chemical plant. Good management also dictates ensuring that all waste water passes through holding basins or tanks before it is discharged if the established quality is met as determined by tests.

Source: OWMC Project Group consulted Waste Technologies Industries document, 1982 (section 20).

A simplified diagram identified as Figure 3.9 is shown on the following page to illustrate one possibility. (Source: Massachusetts, 1982, p. 58. See page 27 for full title.)

3.10 Where will the liquid effluent go?

After the final operation the liquid effluent will be collected in basins or tanks and analyzed to determine if it is suitable for discharge once the contents of the basin or tank have been approved for discharge. No additional treated waste water will be allowed to flow into the basin or tank until the emptying procedures have been completed.

The flow equalization basins or tanks provide the opportunity to verify that the waste water process has been completed successfully. Only then will the treated waste water be allowed to be discharged to a body of water or an approved sewer system leading to a Water Pollution Control plant.

If solidification/stabilization/fixation is an integral part of the liquid effluent treatment then the solidified material will be deposited directly into the engineered landfill or an acceptable alternative as noted in Section 1.7, page 6.

3.11 Will acqueous effluents be monitored?

Sampling procedure and testing is very important in a well-managed treatment facility. The operating procedures will outline the frequency of sampling and the location where samples are to be taken (i.e. sampling point). Test procedures will determine the type of tests required.

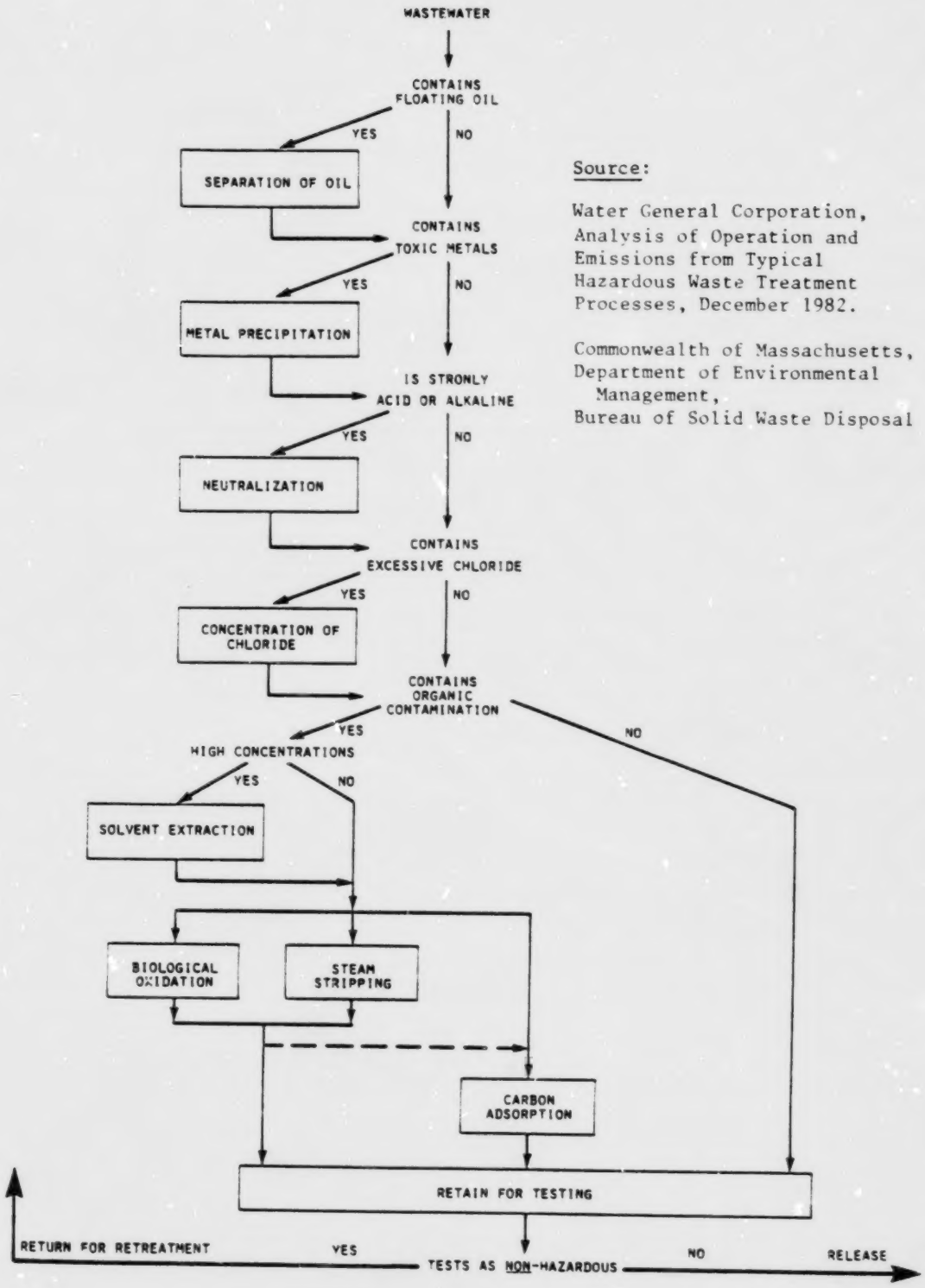
Standard flow measuring devices will measure the quantity of aqueous effluent at various locations at receiving and discharge points.

If total solidification becomes part of the plant operation as noted previously, then the monitoring of aqueous effluents will be modified accordingly.

3.12 Who will monitor air emissions and aqueous effluent?

OWMC will monitor emissions on a regular basis. This is part of the operation. Regulatory agencies such as Ontario's Ministry of the Environment can set up their own monitoring requirements as needed. (Monitoring by Ontario's Ministry of Labour may also be done.)

Figure 3.9



Source:

Water General Corporation, Analysis of Operation and Emissions from Typical Hazardous Waste Treatment Processes, December 1982.

Commonwealth of Massachusetts, Department of Environmental Management, Bureau of Solid Waste Disposal

Figure 3.9 Choice of wastewater treatment.

4.0 Community Impacts

4.1 What will the noise be and over what area?

Noise is the term generally applied to unwanted sound. The unit of measurement of sound levels is the decibel (dB). Levels are measured with a precision sound level meter using an "A" weighting scale. This characteristic is an overall measurement of all sound components with special corrections to simulate the manner in which the human ear responds to sounds of different frequencies or pitches. Such weighted sound levels are stated as dBA.

Community noise levels are comprised of a combination of noises from a number of sources such as traffic, industry and general neighbourhood activities. Figure 4.1 (following page) depicts typical noise levels for different locations in a community.

Community noise levels or environmental noise levels are described in terms of equivalent sound levels (Leq) in dBA. This is an energy average of the sound level taken over a specific period of time. The Ontario Ministry of the Environment analyses noise levels in terms of two daily time periods:

Day/Evening:	07:00 to 23:00 hours
Night:	23:00 to 07:00 hours

The M.O.E. recommended guidelines for sound level limits are set out in the "Model Municipal Noise Control By-Law, August 1978." In general terms the guidelines are set out in Table 5.6 contained in these guidelines.

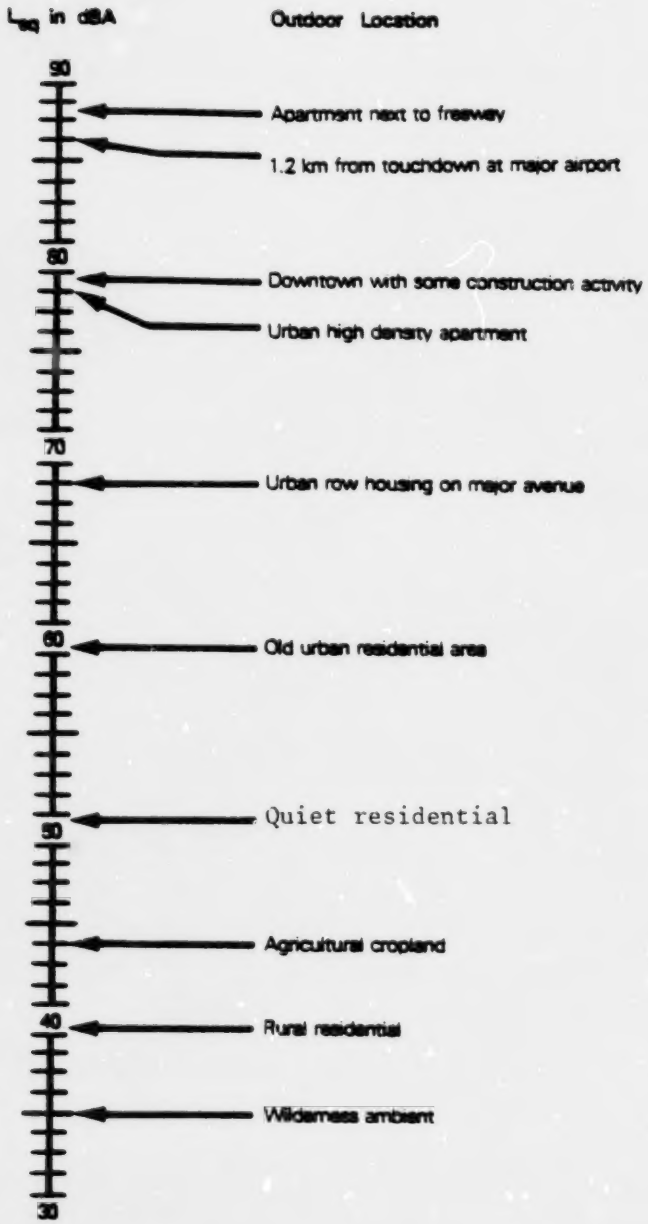
Table 5.6

M.O.E. Guidelines for Sound Level Limits

Outdoor Areas		Leq dBA
Day/Evening:	07:00 to 23:00	55
Night:	23:00 to 07:00	50

The Ontario Ministry of Labour has established noise levels in connection with worker exposure. For occupational noise exposure the permissible noise exposures are set out on a noise level vs exposure duration basis. For example, for an 8-

Figure 4.1



Source: R.L. Hearn GS,
Refuse Burning Study (Phase II),
Volume 1,
Energy Studies & Development Department,
Report No 81023
January, 1981
Ontario Hydro

FIGURE 4.1

Examples of Outdoor 24-hour Average Sound Levels at Various Locations

hour exposure duration the maximum allowable sound level at the workplace is 90 dBA. In Ontario, industrial noise comes under the Occupational Health and Safety Act, 1978 (Section 144). In all areas of the facility, measures will be taken to ensure that worker exposure will not exceed the established limits.

Some communities in Ontario have enacted noise control by-laws. Where such by-laws exist the facility will meet the established requirements. In areas where noise control by-laws do not exist the facility will meet the requirements set out by the Ontario Ministry of the Environment.

During construction of the treatment facility the control of on site construction noise will be aimed at meeting the Ontario Ministry of the Environment guidelines.

During operation of the treatment facility the principal noise contributors will be delivery trucks, rotary kiln operation, incinerator, blowers, pumps, draft fans, etc. Although most of the units of equipment emit noise, enclosures, silencers, or other noise attenuation measures will be provided.

Where the facility contains a physical/chemical treatment plant, the generated noise will be confined to the plant itself. All of the treatment components are enclosed and it is not expected that noise from this plant will spread beyond the site boundaries.

Truck noise from deliveries to the site and truck movements within the site will also contribute to general noise levels. Both the highway and internal truck movements will normally be limited to daylight hours. Noise levels are not expected to increase unduly on highways and roadways leading to the site. Potential noise impacts, both on and off-site, will be an important consideration in comparing the relative suitability of alternative sites.

Sound propagation outdoors is affected by divergence over distance, ground attenuation, air absorption and atmospheric conditions such as wind, temperature and humidity.

Wind and temperature gradients and related atmospheric conditions cause fluctuations in sound levels which on occasion can be quite significant. Because of the complexities introduced by occasional wide variations in atmospheric conditions, calculations and control measures are usually based on data for "normal" conditions which are taken at 20°C. (68°F), relative humidity of 50%, and low or nil wind speeds.

It is possible that noise from the facility could be perceived over a wide area under certain unfavourable atmospheric conditions. However, with the control measures which will be designed into the overall facility, sound levels should not exceed the Ministry of the Environment guidelines at locations beyond the facility buffer zones.

4.3 Can energy from the incinerator be used as a power supplement for neighbouring activities (e.g. residential, industrial, agricultural)?

In many cases (especially in Europe) a waste heat recovery boiler is an integral part of the system. One can generate steam and use steam for in-plant use or for outside activities as a heat source keeping in mind that long steam distribution (by pipeline) may not be practical in some cases. Electricity can also be generated and utilized within the plant with the surplus being fed into the electrical grid. However, the economics have to be carefully evaluated, keeping in mind the relatively low unit cost of electricity in Ontario.

In summary, location, possible utilization and economics dictate energy recovery possibilities.

4.4 Will there be lights and other facilities in operation on a 24 hour basis?

A facility of this type will have lights on all night for safe operation.

The incineration operation is a continuous process and cannot be shutdown once started due to economic and practical reasons. Hence lighting is required on a continuous 7 day per week basis.

However, certain activities such as truck unloading, etc., will be restricted to so-called daytime hours.

For the physical/chemical operation lighting is also required during dark hours.

During one shift per day operation only security lights will be left on at night. If a second shift is required lights will be on but most of the activity will be inside the treatment building.

4.5 If so, can these impacts be mitigated?

Some steps can be taken to lessen the impact such as designing lights mounted on high storage tanks for on-off operation so that lights can be turned on only when required (such as for checking, etc.). Lights on top of buildings can be similarly designed. However, worker safety must never be sacrificed.

4.6 How many people will work there?

It is expected that a fully integrated facility of the size anticipated for initial operation (i.e., a thermal capacity of 90 Mill BTU/h) complete with ancillary operations and a physical/chemical plant will employ between 80 and 120 people some of whom will be working shifts.

4.7 Will any peripheral sources be required which might be supplied from the nearby community?

Depending on the size of the communities in the vicinity of the site(s) and their commercial and industrial development, it is possible, for example, that local contractors and businesses will be used during the construction period. During the operations several additional local services may be employed such as the following:

- some local maintenance - repair work could be done locally;
- local stores can supply needs such as food items, office supplies, etc.;
- accommodations for outside visitors.

This assumes a relatively small sized community. Larger communities can perform more complex work (such as for maintenance repairs).

The question of peripheral services is only one part of a much larger question of potential local benefit. OWMC is presently developing a background paper on the issue of local benefits. Subject areas encompassed by this study include:

- the attraction of industry and investment
- the co-use of facility sites
- employment and income benefits
- employment and purchasing policies
- compensation to communities and individuals.

These investigations are intended to identify policy options which can be explored in discussions with agencies and local community representatives.

5.0 Engineered Landfill

5.1 What type of material will go into the landfill? Will the materials be hazardous?

Only residues from the incineration and physical/chemical treatment plants will be placed in the landfill.

It is anticipated that all residues will be subjected to a solidification process following treatment in either the incinerator or physical/chemical treatment plant.

Solidification/stabilization/fixation processes are generally cement-based and lime-based. Cement-based techniques generally use Portland cement and sludge along with other additives including flyash. Lime-based techniques generally depend on the reaction of lime with fine-grained siliceous material (i.e. material containing silica [SiO_2] - a crystalline compound occurring also naturally as quartz, sand, etc.) and water to produce a hardened material. This material is sometimes referred to as a pozzolanic cement.

The 'slurry' has the appearance of a very lean concrete and often the product after solidification will be of rather low compressive strength and be either solid or granular. Leachate tests being carried out by a number of jurisdictions appear to confirm that leachate from solidified materials will not put the environment at risk. This is because the solidified material has a very low permeability, in the order of 0.0000001 cm per second. (For comparison purposes, fine sand will have a permeability of 0.005 to 0.001 cm per second.) This makes water penetration very difficult and, hence, the leachate formation is extremely slow and the release rate very low indeed. OWMC is continuing to monitor progress in this area.

5.2 Will there be a "working face" which will attract birds?

It is not anticipated that the work face of the landfill will attract birds. The treated waste will be placed in specially prepared cells having a capacity of one year's treated waste. At any one time only a small portion of the landfill site will be exposed.

The cell after excavation will have its sloped sides protected by a stone layer to prevent erosion while it is being filled.

	Birds are attracted to Municipal landfill sites because of food values in the waste and the prospect of worms in freshly moved earth. Neither of these attractions will be available at OWMC's landfill.
5.3 What form will the waste which is going into the landfill be in? Will it be powdery and blow around? If so, will this be hazardous and how can it be avoided?	If waste is solidified it will be rock-like or soil-like. If filter cake is the residue it may still contain 60% moisture. It will not be of a consistency which will easily blow around. Pretreatment has removed the possibility of wastes blowing around.
5.4 What type of vehicles will travel to the landfill? Do these vehicles have any special requirements?	The most likely trucks moving treated wastes will be dump trucks, lugger trucks and tank trucks (to collect leachate). These vehicles will require no special requirements.
5.5 What type, number and frequency of vehicles will be going to the landfill site during construction? How long will this last?	Normal construction and earth moving equipment in small numbers, for say 6 months. Earth moving equipment may come to the site over its life from time to time to excavate and cover the cells as they are finished.
5.6 Will there be a danger of contaminating groundwater?	The ground water will be protected from leachate migration by collection and treatment of leachate and by a significant depth of dense, uniform clay. The leachate itself will be relatively innocuous since the landfilled materials will have low permeability, and the pollutants will be locked in a matrix of cement-like material.
5.7 Will there be a buffer zone around the landfill?	A "technical" buffer around the landfill will be provided sufficent to monitor groundwater movements and to take adequate remedial actions within the site boundaries in the event of groundwater contamination. Leachate will be monitored via monitoring wells. OWMC will do the monitoring. MOE will set the standards. Depending on the characteristics of the area surrounding the proposed site it is also anticipated that a "social" buffer will also be provided. This social buffer will serve to minimize potential impacts as a result of noise, visual intrusion, etc.

5.8 Will there be a danger of contaminating groundwater?	The groundwater will be protected from leachate migration by collection and treatment of leachate. The leachate itself will be relatively innocuous since the landfilled materials will have low permeability, and the pollutants will be locked in a matrix of cement-like material.
5.9 Will there be a buffer zone around the landfill?	A "technical" buffer around the landfill will be provided sufficient to monitor groundwater movements and to take adequate remedial actions within the site boundaries in the event of groundwater contamination. Leachate will be monitored via monitoring wells. OWMC will do the monitoring. MOE will set the standards. Depending on the characteristics of the area surrounding the proposed site it is also anticipated that a "social" buffer will also be provided. This social buffer will serve to minimize potential impacts as a result of noise, visual intrusion, etc.

Phase 3 Public Consultation Meetings

Provincial Network Meetings:

Environment Committee of the Ontario Federation of Agriculture
Toronto, Ontario
11:00 a.m. - September 12, 1983

Ontario Industry and Transportation Associations
Toronto, Ontario
10:00 a.m. - December 12, 1983

Regional Meetings:

Niagara Against Toxins
Niagara Falls, Ontario
4:00 p.m. - October 12, 1983

Canadians for a Clean Environment
Niagara Falls, Ontario
5:00 p.m. - October 12, 1983

Chippawa Watershed Association
Wellandport, Ontario
6:30 p.m. - October 26, 1983

Wainfleet Alert to Chemical Hazards (WATCH)
Wellandport, Ontario
7:00 p.m. - October 26, 1983

West Lincoln Commercial and Industrial Development Board
Wellandport, Ontario
8:00 p.m. - October 26, 1983

Information Days:

Niagara Falls, Ontario
The Old Stone Inn
11:00 a.m. - 8:00 p.m. - October 12, 1983

Milton, Ontario
The Heritage Inn
11:00 a.m. - 8:00 p.m. - October 18, 1983

Wellandport, Ontario
The Schwoob Community Centre
11:00 a.m. - 8:00 p.m. - October 26, 1983

Hamilton, Ontario
Royal Connaught Hotel
11:00 a.m. - 8:00 p.m. - November 9, 1983

Mississauga, Ontario
Huron Park Community Centre
12:00 noon - 8:00 p.m. - November 16, 1983

Brampton, Ontario
Holiday Inn
11:00 a.m. - 8:00 p.m. - January 31, 1984

Weekend Seminars:

Port Colborne Seminar
June 17-18, 1983
(32 participants)

Brantford Seminar
June 24-25, 1983
(31 participants)

Burlington Seminar
July 8-9, 1983
(34 participants)

Phase 3 Public Consultation Meetings

Site Selection Workshops:

Burlington Workshop
October 5, 1983
(20 participants)

Niagara Falls Workshop
October 13, 1983
(28 participants)

Hamilton Workshop
October 19, 1983
(28 participants)

Hamilton Workshop
January 6-7, 1984
(62 participants)

Supplemental Meetings:

Candidate Area Heads of Council
Hamilton, Ontario
1:00 p.m. - May 17, 1983

Town of Milton
Milton, Ontario
7:00 p.m. - June 6, 1983

Township of Wainfleet
Wainfleet, Ontario
7:30 p.m. - June 14, 1983

Town of Lincoln
Beamsville, Ontario
7:30 p.m. - June 20, 1983

Canadians for a Clean Environment
Niagara Falls, Ontario
7:30 p.m. - June 23, 1983

Regional Municipality of Hamilton-Wentworth
Hamilton, Ontario
5:00 p.m. - June 27, 1983

City of Brantford
Brantford, Ontario
7:00 p.m. - June 28, 1983

Regional Municipality of Niagara and City of Thorold
Thorold, Ontario
7:00 p.m. - June 29, 1983

City of Welland
Welland, Ontario
7:00 p.m. - July 5, 1983

Town of Stoney Creek
Fruitland, Ontario
7:30 p.m. - July 12, 1983

Regional Municipality of Halton Planning and Public Works Committee
Oakville, Ontario
10:30 a.m. - July 27, 1983

Town of Fort Erie
Fort Erie, Ontario
7:30 p.m. - September 26, 1983

Ontario Ministry of Agriculture and Food
Toronto, Ontario
October 4, 1983

Township of West Lincoln Planning Staff
Smithville, Ontario
1:30 p.m. - October 6, 1983

Regional Municipality of Peel
Brampton, Ontario
1:30 p.m. - October 13, 1983

City of Port Colborne
Port Colborne, Ontario
7:30 p.m. - October 24, 1983

Township of West Lincoln
Smithville, Ontario
7:30 p.m. - November 3, 1983

Phase 3 Public Consultation Meetings

Greenpeace Foundation
Toronto, Ontario
November 8, 1983

City of Niagara Falls and Niagara Against Toxins
Niagara Falls, Ontario
7:00 p.m. - November 24, 1983

Municipal Representatives
Toronto, Ontario
10:00 a.m. - January 11, 1984

City of Welland and Living in a Free Environment (LIFE)
Toronto, Ontario
2:00 p.m. - January 11, 1984

Regional Municipality of Peel Council
Brampton, Ontario
1:30 p.m. - February 9, 1984

West Lincoln Business and Development Board
Smithville, Ontario
7:30 p.m. - February 20, 1984

OWMC Site Selection Workshop:

January 6-7, 1984
Hamilton, Ontario

List of Participants:

Dr. Doug Banting
RYERSON POLYTECHNICAL INSTITUTE

Mrs. Ellenor Black
CHIPPAWA WATERSHED ASSSOCIATION

Mr. & Mrs. M. Bowden
LIVING IN A FREE ENVIRONMENT (LIFE)

Mr. Ken Bradley
UNIROYAL CHEMICAL

Mr. Hugh Brown
BINBROOK ANTI-DUMP COMMITTEE

Mr. Hans Burger
ONTARIO FEDERATION OF AGRICULTURE - Niagara South

Ms. Kirsten Burling
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Ms. Jackie Calabretta
NIAGARA AGAINST TOXINS (NAT)

Mr. Don Cook
NIAGARA REGION EEAC

Mr. Earl Cowan
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Mr. Jim Csanig
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Mrs. Leslie Daniels
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Mr. Gurl Dhaliwal
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Mr. David Dick
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Professor Michael Dickman
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Mr. Ken Durham
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Mr. Bob Edmondson
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Ms. Joan Field
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Phase 3 Public Consultation Meetings

Mrs. Verna C. Flowers
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Mr. Tom Foster
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Mr. David Greenfield
HALTON EEAC

Professor Murray Haight
SCHOOL OF URBAN AND REGIONAL PLANNING (University of Waterloo)

Mr. Clyde Halford
CITIZENS AGAINST MIDDLEPORT STORAGE OF PCB (CAMSOP)

Mr. Jim Hasler
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Dr. Michael Hayes
DEPARTMENT OF CLINICAL EPIDEMEOLOGY (McMaster University)

Mrs. Patricia Hayes
NIAGARA ECOSYSTEM TASK FORCE

Mr. Paul Hetherington
MISSISSAUGA CLEAN CITY CAMPAIGN

Mrs. Margherita Howe
OPERATION CLEAN

Mr. John Jackson
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Ms. Iris Kairow
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PROVINCIAL COUNCIL OF WOMEN OF ONTARIO (St. Catharines Chapter)

Rev. Leslie King
DUNDALK UNITED CHURCH

Mr. Wayne Knox
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Mr. A.E. Kruzins
DOFASCO INC.

Mr. Wayne Liebaw
ONTARIO FEDERATION OF AGRICULTURE - Niagara South

Mr. Stuart Lord
WEST LINCOLN BUSINESS AND DEVELOPMENT BOARD

Mrs. Sheila May
BINBROOK ANTI-DUMP COMMITTEE

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Mr. Keith McConachie
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Mr. Ray Nash
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Mayor Stan Pettit
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Phase 3 Public Consultation Meetings

Mr. Charlie Pryer
NIAGARA FALLS NATURE CLUB

Mr. Melvin Ruch
WELLAND LABOUR COUNCIL

Mr. Al Sams
NIAGARA AGAINST TOXINS (NAT)

Ms. Barbara Schellenberg
MISSISSAUGA-KANE ROAD RATEPAYERS ASSOCIATION

Ms. Caroline Siller
MISSISSAUGA-KANE ROAD RATEPAYERS ASSOCIATION

Mr. Sidney Sisler
CHIPPAWA WATERSHED ASSOCIATION

Mr. Hans Steele
ONTARIO FEDERATION OF AGRICULTURE - Niagara South

Mr. Don Steward
NIAGARA FALLS CHAMBER OF COMMERCE

Ms. Rene Tunney
HALDIMAND-NORFOLK ORGANIZATION FOR A PURE ENVIRONMENT (HOPE)

Mr. Ben Walpot
ONTARIO FEDERATION OF AGRICULTURE - Haldimand

Mr. J. Yovanov
ONTARIO FEDERATION OF AGRICULTURE - Hamilton-Wentworth

OWMC Site Selection Process Review Workshop:

October 19, 1983
Hamilton, Ontario

List of Participants:

Dr. Mikio Chiba
AGRICULTURE CANADA

Mr. Russ Johnson
RIDGETOWN COLLEGE

Mr. J. Yovanov
ONTARIO FEDERATION OF AGRICULTURE - HAMILTON-WENTWORTH

Mrs. Phyllis Kerkhoven
ST. CATHARINES CHAPTER - PROVINCIAL COUNCIL OF WOMEN OF ONTARIO

Ms. Anne Koven
UPPER OTTAWA STREET LANDFILL SITE STUDY

Ms. Bernice McLean
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CITIZENS AGAINST MIDDLEPORT STORAGE OF PCB (CAMSOP)

Mr. Clyde Halford
CITIZENS AGAINST MIDDLEPORT STORAGE OF PCB (CAMSOP)

Mr. Colin Isaacs
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Mr. John Jackson
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Mr. Phil Weller
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Mr. Stuart Lord
WEST LINCOLN BUSINESS AND DEVELOPMENT BOARD

Prof. Ross Hall
McMASTER UNIVERSITY

Phase 3 Public Consultation Meetings

Mr. Dave Hardy
CONSERVATION COUNCIL OF ONTARIO

Dr. Ian Cunningham
REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

OWMC Site Selection Process Review Workshop:

October 13, 1983
Niagara Falls, Ontario

List of Participants:

Mr. Jim Hasler
PRESERVATION OF AGRICULTURAL LANDS SOCIETY (PALS)

Mr. Ben Walpot
ONTARIO FEDERATION OF AGRICULTURE - HALDIMAND

Mr. Ken Durham
ONTARIO FEDERATION OF AGRICULTURE

Mr. Keith McConachie
ONTARIO FEDERATION OF AGRICULTURE - HALDIMAND

Mr. Hans Burger
ONTARIO FEDERATION OF AGRICULTURE - NIAGARA SOUTH

Mrs. Leslie Daniels
BETTER UNDERSTANDING COMMITTEE

Mrs. Sue E. Merritt
WEST LINCOLN TASK FORCE AGAINST TOXIC WASTE

Ms. M. Jacobs
WEST LINCOLN TASK FORCE AGAINST TOXIC WASTE

Mayor Stan Pettit
WAINFLEET ALERT TO CHEMICAL HAZARDS

Ms. Vivian Dilts
WAINFLEET ALERT TO CHEMICAL HAZARDS

Ms. Jackie Calabretta
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Mr. Al Sams
NIAGARA AGAINST TOXINS (NAT)

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Mr. Peter Sobol
NIAGARA EEAC

Prof. Michael Dickman
BROCK UNIVERSITY

Mr. Tom Drenth
CHIPPAWA WATERSHED ASSOCIATION

Mr. Sidney Sisler
CHIPPAWA WATERSHED ASSOCIATION

Mrs. Patricia Hayes
NIAGARA ECOSYSTEM TASK FORCE

Mr. W.C. Thompson
NIAGARA FALLS CHAMBER OF COMMERCE

Mr. & Mrs. L. Ziff
GREATER FORT ERIE CHAMBER OF COMMERCE

Mr. Dave Jukes
GENERAL MOTORS

Mr. I. Carruthers
SMITHVILLE DISTRICT CHAMBER OF COMMERCE

Mr. Gurl Dhaliwal
NORTON COMPANY

Phase 3 Public Consultation Meetings

Mr. Otto Urbanovics
UNITED STEELWORKERS OF AMERICA

Mr. Melvin Ruch
WELLAND LABOUR COUNCIL

Mrs. M. Howe
OPERATION CLEAN

Mr. Tony Sagat
NIAGARA SOCIAL PLANNING COUNCIL

OMMC Site Selection Process Review Workshop:

October 5, 1983
Burlington, Ontario

List of Participants:

Mrs. Verna C. Flowers
ASSOCIATION OF PEEL PEOPLE EVALUATING AGRICULTURAL LAND (APPEAL)

Mr. Tom Foster
ONTARIO FEDERATION OF AGRICULTURE - HALTON

Mr. Jim Early
ONTARIO FEDERATION OF AGRICULTURE - PEEL

Mr. Henry Stanley
ONTARIO MINISTRY OF AGRICULTURE AND FOOD

Mr. S. Chumley
SOLID WASTE COMMITTEE OF THE WEST BURLINGTON RATEPAYERS GROUP

Mr. Gordon Kidd
CENTRAL ESQUESING RATEPAYERS ASSOCIATION

Mr. Paul Hetherington
MISSISSAUGA CLEAN CITY COMMITTEE

Mr. Bob Johnson
TREMAINE BRITTANIA CITIZENS GROUP

Ms. Mary Johnson
TREMAINE BRITTANIA CITIZENS GROUP

Dr. Ruth Hussey
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Dr. Lorelie Mitchell
SOUTH PEEL NATURALISTS ASSOCIATION

Mr. Gordon Johnson
PINEHILL HUNTERS AND ANGLERS

Mr. Harold Saunders
PINEHILL HUNTERS AND ANGLERS

Mrs. Sheila May
BINBROOK ANTI-DUMP COMMITTEE

Ms. Lydia Jones
BURLINGTON CHAMBER OF COMMERCE

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UNIROYAL CHEMICAL

Mr. Paul Wendt
PIERCE WILSON LIQUID DISPOSAL LTD.

Mr. A.E. Kruzins
DOFASCO INC.

Dr. Clyde Hertzman
MCMASTER UNIVERSITY

Rev. Leslie King
DUNDALK UNITED CHURCH

Mr. Ray Nash
UNITED CHURCH ENVIRONMENTAL ASSESSMENT PROJECT

Mr. D. RAE
CITY OF BURLINGTON SOCIAL PLANING COUNCIL

Phase 3 Public Consultation Meetings

OWMC Seminar on Industrial Waste Management:

July 8-9, 1983
Burlington, Ontario

List of Participants:

Mr. Tom Armstrong
UNITED AUTO WORKERS

Councillor Liz Behrens
TOWN OF OAKVILLE

Dr. Jim Bendell
MEADOWWOOD RATTRAY RESIDENTS ASSOCIATION

Mrs. Yvonne Bendell
COUNCIL OF SOUTH MISSISSAUGA COMMUNITY ASSOCIATION

Mr. James Best
BEST PUMPING SERVICE

Mr. Doug P. Birchill
C.P. RAIL

Mr. R.M. Bright
FORD OF CANADA

Mr. Dirk Blyleven
CITY OF MISSISSAUGA

Mr. J.P. Charlebois
FEDERATION OF ONTARIO NATURALISTS

Mr. John Davies
MASSEY FERGUSON INDUSTRIES LTD.

Mrs. Nancy Harper
UNIVERSITY WOMEN'S CLUB OF BURLINGTON

Ms. Margaret Hewitt
UNITED AUTO WORKERS

Mr. Chuck Jacobs
ONTARIO MINISTRY OF AGRICULTURE AND FOOD

Alderman Fred Key
CITY OF BRAMPTON

Mayor Gordon Krantz
TOWN OF MILTON

Mr. David Latter
INTER-PROVINCIAL COOPERATIVES OF ONTARIO

Mr. Gary Leppard
CANADA CENTRE FOR INLAND WATERS

Mr. Duncan McCracken
POLYSAR CORP.

Ms. Marie McKelvie-Trichilo
REGION OF PEEL SOCIAL PLANNING COUNCIL

Mrs. Rose Menyes
CREDIT VALLEY CONSERVATION AUTHORITY

Mr. Thomas E. Munt
C.P. RAIL

Mr. John Novak
UNITED AUTO WORKERS

Mr. Robert Redhead
TRICIL LTD.

Ms. Martha Rogers
REGISTERED NURSES ASSOCIATION OF ONTARIO

Councillor John Santarelli
TOWN OF STONEY CREEK

Mr. Al Schuldt
STELCO INC.

Mr. Warren Stein
ONTARIO PORK PRODUCERS

Phase 3 Public Consultation Meetings

Mr. Murray Stephen
HALTON REGION CONSERVATION AUTHORITY

Mr. Alex Thomas
THOMAS WASTE REMOVAL LIMITED

Mr. Siem Vandenbroek
HUMBER COLLEGE

Mr. Tom Vardy
INTERNATIONAL UNION OF ELECTRICAL, RADIO AND MACHINE WORKERS

Mr. Paul Wendt
PIERCE WILSON LIQUID DISPOSAL LTD.

Mr. Dave Whiting
N.E.C.

Mr. John Wilson
PIERCE WILSON LIQUID DISPOSAL LTD.

OWMC Seminar on Industrial Waste Management:

June 24-25, 1983
Brantford, Ontario

List of Participants

Mr. Tom Baker
MAC'S LIQUID DISPOSAL LTD.

Mr. David Botts
LAUREL CREEK NATURE CENTRE

Mr. Ken Bradley
UNIROYAL CHEMICAL

Dr. F.M. Cole
INDIVIDUAL

Mayor Jim Earl
TOWN OF SIMCOE

Mr. Randy Haber
STELCO INC.

Mr. Clyde Halford
TOWNSHIP OF ONONDAGA

Dr. Ross Hall
DEPARTMENT OF BIOCHEMISTRY (McMaster University)

Dr. Michael Hayes
DEPARTMENT OF CLINICAL EPIDEMEOLOGY (McMaster University)

Mr. Phil Hinman
ONTARIO SECONDARY SCHOOL TEACHERS FEDERATION

Mr. Ed Hunt
HAMILTON LABOUR COUNCIL

Mr. Iain Jaffray
BRANTFORD LABOUR COUNCIL

Mr. Lee Kennaley
REGIONAL MUNICIPALITY OF HALDIMAND-NORFOLK

Mr. Ed Kristufek
ENERGY SYSTEMS MANAGEMENT PROGRAM (Mohawk College)

Mr. Andy Leishman
ONTARIO FEDERATION OF AGRICULTURE - Brantford

Mr. Gary Luton
BRANTFORD DEVELOPMENT BOARD

Mr. Ray Nash
UNITED CHURCH ENVIRONMENTAL ASSESSMENT PROJECT

Mr. Robert Noble
ROBERT NOBLE LIMITED

Mr. Jim Oliver
LONG POINT REGION CONSERVATION AUTHORITY

Ms. Carolyn Oster
HALDIMAND 4H CONSERVATION CLUB

Phase 3 Public Consultation Meetings

Miss Anne Pinnegar
HALDIMAND-NORFOLK ORGANIZATION FOR A PURE ENVIRONMENT (HOPE)

Mr. Bob Rose
HAMILTON LABOUR COUNCIL

Mr. Clayton Schwegler
ONTARIO FEDERATION OF AGRICULTURE

Councillor Orval Shortt
CITY OF NANTICOKE

Dr. Tony Smith
GRAND RIVER CONSERVATION AUTHORITY

Mr. R.J. Spence
CANADIAN NATIONAL RAILWAY

Mr. Stan Spencer
REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

Mr. Terry Spiers
CITY OF BRANTFORD

Mr. Allen Sroka
PALRO LIQUID WASTE REMOVAL LTD.

Dr. Jack R. Vallentyne
CANADA CENTRE FOR INLAND WATERS

Mr. George Vansickle
ONTARIO FEDERATION OF AGRICULTURE - Brantford

OMMC Seminar on Industrial Waste Management:

June 17-18, 1983
Port Colborne, Ontario

List of Participants:

Mayor Eric Bergenstein
TOWN OF PELHAM

Mrs. Ellenor Black
CHIPPAWA WATERSHED ASSOCIATION

Mr. Leo Bruzzese
NIAGARA ESCARPMENT COMMITTEE

Mr. Peter Buis
ONTARIO FRUIT AND VEGETABLE GROWERS

Dr. Mikio Chiba
AGRICULTURE CANADA

Alderman Allard Colyn
TOWNSHIP OF WEST LINCOLN

Mr. William Cooper
NIAGARA FALLS LABOUR COUNCIL

Alderman Dona Coville
CITY OF NIAGARA FALLS

Mrs. Leslie Daniels
BETTER UNDERSTANDING COMMITTEE

Ms. Josie D'Alessandro
SOCIAL PLANNING COUNCIL OF NIAGARA

Mr. Guri Dhaliwal
NORTON COMPANY

Dr. Michael Dickman
NIAGARA EEAC

Rev. Patrick Doran
LINCOLN LABOUR COUNCIL

Mrs. Gloria Dupuis
ST. CATHARINES LABOUR COUNCIL

Mr. Bill Fell
ONTARIO PAPER COMPANY

Mr. Vic Filippini
PORT COLBORNE LABOUR COUNCIL

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APPENDIX FOR CHAPTER 4
OF THE OWMC PHASE 3 REPORT

March 1984

Introduction

The text and table in the following pages are referenced in Chapter 4 of the OWMC Phase 3 Report and contain the following:

- a brief introduction to the site selection process; and
- Table A4.1: Site Selection Objectives.

THE SITE SELECTION PROCESS

The purpose of this portion of the Appendix is to expand on some aspects of the site selection process not fully detailed in Chapter 4 in the Phase 3 Report.

Chapter 4 in the Phase 3 report describes the 5 step site selection process adopted by OWMC. The Phase 3 Report addresses the third step in that process - the identification of candidate sites within candidate areas. Chapter 4 also describes the site selection principles and the three site selection goals adopted by OWMC which are, in order of importance:

Minimize risk to human health
Minimize environmental impacts
Minimize financial costs to OWMC.

Although this ranking reflects the general priorities of OWMC and the public, it is also recognized that there will be instances where these goals overlap in significance. For example, there may be instances where relatively minor risk-related concerns are superceded by major environmental impacts. Similarly, a major cost consideration might supercede a minor risk or environmental impact consideration.

In addition to these three goals, specific objectives were also formulated. The objectives represent a refinement and elaboration of the goals. In the case of the goal of minimizing environmental impacts, for example, the objectives specify different elements of the environment to be protected.

The goals and objectives apply to the entire site selection process. As discussed in Chapter 5, for each stage in the process specific factors have been identified which pertain to the areas of concern being addressed at one stage in the site selection process.

A large number of objectives have been developed to assist in shaping and directing the site selection process. These objectives are listed in Table A4.1.

No one site can satisfy all the site selection objectives. With any given site or area under consideration, some objectives will be largely satisfied. Other objectives will not be satisfied or will only be partially satisfied. Thus, in the process of identifying and comparing potential sites, consideration was given to differences in the levels of satisfaction of various objectives. For example, tradeoffs may have to be made between a facility location in an area of potential environmental significance versus a location on good agricultural land. The consideration of such "tradeoffs" is crucial to decisions regarding the relative suitability of alternative sites as well as to decisions concerning the acceptability of the risks, impacts and costs associated with the preferred site(s).

TABLE A4.1

Site Selection Objectives

I **GOAL**

* To minimize risk to human health.

OBJECTIVES

A. Site - "Pathways" into the Environment

1. To site facility components in hydrogeologic settings that will restrict naturally the movement of contaminants and protect ground water resources, and to utilize engineering measures where required to ensure maximum environmental safety.

2. To site facility components in hydrogeologic settings that will restrict naturally the movement of contaminants and protect human health, surface water resources and aquatic ecosystems.

3. To site facility components in airsheds that have atmospheric dispersion characteristics which will protect air quality and aquatic and terrestrial ecosystems.

4. To site facility components in settings that minimize the hazards to the site as a result of such conditions as flooding, potential susceptibility to seismic disturbance, and slope failures, and to utilize engineering measures where required to ensure maximum environmental safety.

5. To site facility components in settings that facilitate environmental monitoring as well as the application of countermeasures, including backup emergency services.

6. To site facility components to minimize potential contamination of food chains in the environment.

7. To site facility components to minimize hazards to the site from other uses which might contribute to the likelihood or severity of a release of contaminants.

8. To locate effluent discharge locations (if required) with dispersion characteristics that will protect human health, surface water resources and aquatic ecosystems.

TABLE A4.1

Site Selection Objectives

B. Site - Human Exposure

1. To site facility components to minimize the number of people who might be exposed, as well as the duration of their exposure, to contaminants in the event of a release.

2. To site facility components to minimize the potential for the contamination of existing wells and other sources of water for human or animal consumption.

3. To site facility components to minimize the potential for exposure of populations who are sensitive to exposure and/or are difficult to evacuate.

C. Transportation and Discharge - "Pathways" into the Environment

1. To select transportation routes and modes which minimize the likelihood of a release of contaminants during transit.

2. To site facility components so that the physical settings along the access routes to the site(s) naturally restrict the movement of contaminants and protect human health, terrestrial and aquatic ecosystems.

D. Transportation and Discharge - Human Exposure

1. To site facility components to minimize the number of people who might be exposed and the duration of that exposure to contaminants along access routes to the site(s) in the event of a release.

2. To site facility components to minimize the potential for exposure of populations who are sensitive to exposure and/or are difficult to evacuate along access routes to the site(s).

II GOAL

• To minimize environmental impacts.

OBJECTIVES

A. Physical and Biological

1. To avoid destruction and minimize disruption of significant natural ecosystems.

TABLE A4.1

Site Selection Objectives

2. To avoid destruction and minimize disruption of significant vegetation or wildlife populations.

3. To avoid destruction and minimize disruption of rare or uncommon species of plant and animal life.

4. To avoid destruction and minimize disruption to significant landforms and other physical features.

5. To minimize physical impacts on surface water such as sedimentation and changes in base flow.

6. To minimize impacts on surface water quality from emissions.

B. Resources

1. To minimize the amount of land required to safely construct and operate the facility component(s).

2. To minimize displacement of prime agricultural soils.

3. To minimize displacement and disruption of existing farm enterprises.

4. To minimize disruption to productive agricultural areas and to stable agricultural communities.

5. To minimize displacement and disruption to other natural resource uses such as mineral aggregates.

6. To minimize disruption of economically and/or recreationally important biological resources.

7. To minimize displacement of and disruption to heritage and archaeological resources.

8. To minimize displacement of areas with a high potential for resource development.

TABLE A4.1

Site Selection Objectives

C. Land Uses and Land Ownership

1. To minimize conflict with existing, committed, proposed and planned land uses.

2. To maximize the potential for the establishment of the facility components in locations characterized by similar industrial uses.

3. To minimize the amount of private property required and the disruption to land ownership patterns.

4. To minimize conflict with Federal, Provincial, municipal and native communities, policies, programs and plans.

D. Social

1. To minimize the displacement of people, particularly those groups and individuals vulnerable to change.

2. To minimize conflict between the facility components, operations and the use and enjoyment of properties in the vicinity of the site(s), as a result of visual intrusion, noise, etc.

3. To minimize losses or impacts on buildings and features of archaeological, historical, symbolic, cultural or social significance.

4. To maximize compatibility between the facility components and the character, image, traditions and lifestyle of the affected area.

5. To establish the facility components, to the extent possible, in areas in which the local communities can adapt to the type of changes which might result from the project.

6. To maximize community acceptance of the facility components.

7. To maximize compatibility with the visual character and appearance of the landscape in the vicinity of the facility components.

TABLE A4.1

Site Selection Objectives

8. To minimize conflict between the transportation of hazardous wastes to the facility components and the use and enjoyment of properties along access routes to the site(s).

9. To minimize conflict between facility-related traffic and local traffic by ensuring that access routes provide an acceptable level of service.

E. Economics

1. To maximize local employment opportunities.

2. To minimize the displacement of businesses.

3. To minimize property value depreciation.

4. To minimize disruption to the operations of local businesses.

5. To maximize compatibility with the local and regional economic character of the affected area.

6. To minimize adverse effects upon the provision and use of public and private community services and facilities.

7. To minimize the burden on municipal services and finance.

III GOAL

° To minimize financial costs to OWMC.

OBJECTIVES

A. To minimize capital and operating costs to the greatest extent possible without sacrificing environmental quality.

1. To minimize approvals costs.

2. To minimize site acquisition costs.

TABLE A4.1

Site Selection Objectives

3. To minimize on-site development costs, e.g. clearing, drainage, grading, screening and other engineering modifications.

4. To minimize off-site development costs, e.g. service extensions, road improvements.

5. To minimize development and/or operations costs associated with the construction and operations of the facility component(s), e.g. duplicate facilities.

6. To minimize development and/or operations costs necessitated by site or area characteristics, e.g. special remedial or monitoring measures to protect human health and the environment.

7. To minimize on and off-site development and/or operations costs associated with effluent dispersion, e.g. pipelines.

8. To minimize transportation operations costs associated with hauling hazardous wastes to and among facility components.

APPENDIX FOR CHAPTER 5
OF THE OWMC PHASE 3 REPORT

March 1984

Introduction

The text and tables in the following pages are referenced in Chapter 5 of the OWMC Phase 3 Report. This appendix is directly relevant to the description of the selecton of candidate sites and contains the following:

- a brief description of the constraint mapping process;
- Table A5.1: Constraint Mapping Factors - Definitions and Significance;
- Table A5.2: Constraint Mapping Factors - Exclusionary;
- Table A5.3: Constraint Mapping Factors - Non-Exclusionary;
- a statement of the results of the site screening process;
- Table A5.4: Summary Analysis - Site Screening;
- an outline of the comparative evaluation process and results;
- Table A5.5: Initial Comparative Evaluation Factors - Definitions and Significance; and
- Table A5.6: Comparative Evaluation of Siting Options.

THE SELECTION OF CANDIDATE SITES

Introduction

This portion of the Appendix provides support material for Chapter 5 of the Phase 3 Report - The Selection of Candidate Sites. As outlined in Chapter 5 the process of selecting candidate sites was divided into three major stages:

- The identification of site areas within candidate areas, by eliminating those that appear to be unsuitable areas, through a process of "constraint mapping".
- The identification of specific potential sites within the remaining site areas.
- The comparison of these potential sites and the setting aside of some to produce a short list of candidate sites.

This Appendix provides support material for the analyses described in Chapter 5. A more detailed description of the process is provided in separate technical support documents.

The Identification of Site Areas (Constraint Mapping)

Constraint mapping is a process by which factors are mapped and areas unsuitable for the location of the three facility components - engineered landfill, physical/chemical treatment plant and incinerator - are identified and then excluded from further consideration at this time.

The factors which were employed in the constraint mapping step are indicated in Table A5.1. A definition of each factor, as well as a brief description of the significance of each factor in terms of potential risks to

human health and environmental and community impacts, is provided in the table.

An important part of the constraint mapping process was reaching decisions regarding which factors should be treated as "exclusionary" and which factors should not be treated as "exclusionary". An exclusionary factor is one which, when identified by mapping, would render a location unsuitable for a given facility component.

Tables A5.2 and A5.3, respectively, specify which factors were considered to be exclusionary and which factors were considered to be non-exclusionary. The tables also indicate the rationale behind those decisions. As indicated in the tables there were some differences in the treatment of the factors depending on the facility component under consideration. Important considerations in OWMC's deliberations on these matters were the comments and suggestions received at a series of site selection workshops.

Once decisions were reached regarding the treatment of the factors, two sets of composite constraint maps were prepared. One set of maps was for the purpose of identifying potentially suitable areas for a landfill or fully integrated facility. The other set of maps was intended to assist in identifying areas suitable for an incinerator, a physical/chemical treatment plant, or an incinerator together with a physical/chemical treatment plant.

The constraint mapping work described to this point resulted in the identification of 65 landfill/integrated (LF) and 87 physical/chemical treatment/incinerator (PI) site areas.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
1. PHYSICAL AND BIOLOGICAL RESOURCES	
1.1 Till and Clay Plains	
Level to gently rolling areas of silty clay soils that, in the Niagara Peninsula, were originally the bottom of a glacial lake. In the Halton area, the clay plains are primarily glacial till, left behind when the glacier melted.	The fine grained soils of these areas should act to inhibit the underground movement of contaminants.
1.2 Drumlin (Halton)	
Drumlins are distinct oval shaped hills of glacial till.	The drumlins in Halton consist of the same fine grained silty to clayey Halton Till that occur in the surrounding areas. As such, they should have the same potential for siting facilities as described under the Till and Clay Plain factor except for the potential for more severe slopes.
1.3 Drumlin (Niagara)	
Drumlins are distinct oval shaped hills of glacial till.	The drumlins in this area are composed of the granular Wentworth Till, which could provide pathways for off-site migration of contaminants into the groundwater.
1.4 Drumlin Fields	
The extent of the drumlin field shows the approximate limits of an area which may contain buried drumlins consisting of granular Wentworth Till. Known locations of	Should buried drumlins or other areas of Wentworth Till be encountered in this area, they could provide pathways for off-site migration of contaminants in the groundwater from a facility located in such an environment.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
	drumlins exposed at the surface also occur within this area.	
1.5	Surface Granular Soil	
	Surface granular soils include sands derived from a variety of sources and their thickness and relationship to both underlying and adjoining materials are largely unknown.	Surface granular soils are significant because they provide ready pathways for off-site movement of contaminants in the groundwater flow system, which could adversely affect both surface and groundwater resources.
1.6	Moraine	
	These features are primarily composed of glacial till materials that have been dragged along by the movement of a glacier. Lenses and pockets of granular materials may be associated with these features, occurring either at the surface or buried beneath the till.	The possible inclusion of buried pockets of granular soils could provide potential migration paths for off-site contaminant movement. The geological history of a location suggests the possible occurrence of variable subsurface conditions.
1.7	Poor Surface Drainage	
	Areas of the Haldimand Clay Plain which contain numerous shallow depressions (swales) with little or no developed drainage pattern. These depressions may contain shallow organic soils and may hold water for most of the year.	The individual wetland features found within this area are not of high significance to the location and construction of facilities. They may require drainage and other engineering works (i.e., excavation and filling) but may also require remedial measures to control potential adverse effects of site drainage.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
1.8 Wetland	
These are depressional areas which may have high water table conditions and/or standing water for much of the year. They usually support the growth of wetland type plants. As a result of the decay and accumulation of plant material, shallow organic soils have developed in these areas.	These areas may require remedial drainage and/or excavation and filling for the construction of facilities. Poor foundation materials, the presence of saturated soils or flooding conditions, and the possibility of movement of potential contaminants within the wetland areas are the major items to contend with when considering these areas for siting facilities. These areas may also serve a natural function of regulating stream flow by helping to reduce flooding during periods of high run-off and augmenting stream flow during dry periods. Aside from losing this role, should they be used as a facilities site, they have potential importance from a biological point of view in that they may support aquatic life and vegetation associations that wildlife depend on. In some instances they may be used for watering of domestic animals and wildlife.
1.9 Stream Course	
These streams represent the major tributaries to the main creeks and rivers. They have distinct valley forms as identified on 1:50,000 scale air photos.	Surface watercourses provide an avenue for the rapid movement of potential contaminants, thus potentially affecting potable water supplies and aquatic life. Facilities located on stream course valleys may also be subject to structural damage by flooding. In some cases, relocation of the stream and/or providing engineered protective works may provide solutions for these concerns.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
1.10 Flood Plain These areas are flat lands adjacent to rivers or stream courses which may flood from time to time, especially during spring run-off or as a result of heavy prolonged storms.	Inundation or damage caused by flooding of any of the facilities could result in the rapid release of contaminants into surface water. To avoid flooding of the facility, fill would have to be placed and adequately protected. However, this could cause a constriction to the normal hydrology of the stream, which would need site specific study. The alluvial soils of the flood plain are often granular textured and could allow easy off-site migration of contaminants.
1.11 Significant Environmental Units (SEUs) Significant environmental units (SEUs) recognized in published reports on regional studies have been documented. Major sources of information include reports prepared by or for Conservation Authorities, Regional Municipalities and the Ministry of Natural Resources. MNR materials include areas of Natural and Scientific Interest files, District Land Use Guidelines and fish migration route maps. Discussions with Conservation Authorities, Regional Municipalities, and MNR personnel also provided information.	Significant environmental units may: ° contain populations of rare or uncommon plants or animals; ° perform significant environmental functions; ° provide habitat for species which require extensive territories; ° contain unique biological associations or communities; ° maintain a significant warm water fishery which provides fishing opportunities or serve as cold water fishery migratory routes; ° represent significant earth science features.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
	The rationale is to avoid elimination of and to minimize impacts on areas which are known to be environmentally significant.
1.12 Non-SEU Woodlots Greater Than 20 ha.	
Wooded areas which are not Significant Environmental Units but which are greater than 20 ha (50 acres) in area.	This factor indicates the presence of a vegetated unit which may have value as a forestry or recreational resource or provide wildlife habitat. This factor flags areas which may have potential for significance but may not have been studied during environmentally sensitive area or other inventories.
2. AGRICULTURE	
2.1 Agricultural Land Capability	
Agricultural land capability represents the potential and limitations of the land for growing common field crops (e.g. corn, wheat, hay).	Highly productive soils with a favourable climate for producing agricultural crops are in short supply in Canada. Loss of such soils to non-agricultural uses limits future food production potential and local agricultural economies.
The capability system used to rate candidate area soils is the Soil Capabililty for Agriculture system of the Canada Land Inventory. Soil survey information was obtained from the Ontario Institute of Pedology.	
• Class 1 land is potentially the most productive for common field crops.	Using parts of these agricultural lands for non-agricultural purposes will have impacts on existing and future crop production. The greatest impact would

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
° Class 2 land is potentially 80% as productive as Class 1 land for field crops. ° Class 3 land is potentially 64% as productive as Class 1 land for field crops. ° Class 4 land is 49% as productive as Class 1 land for field crops. ° Land classified as Class 5, 6 or 7 is the least productive agricultural land (less than 32% as productive as Class 1 land). There is no available system for evaluating land for specialty crops such as fruits.	occur if Class 1 and 2 lands were taken out of production and the least impact would occur if Class 5, 6 or 7 lands were taken out of production. Besides their higher crop yield potential the higher capability soils are able to support a broader range of crop types and thus have more flexibility for adaptation of future production technology.
2.2 Agricultural Cropping System	
A description of the current cropping activity in the candidate areas based on mapping of crop rotation systems. Agricultural Land Use Systems maps were prepared by the Land Resource Research Institute of Agriculture Canada and the Ontario Ministry of Agriculture and Food.	The mapping of existing agricultural cropping will indicate the type and level of utilization of the land resource for the production of crops. Different combinations of crops, known as rotations or cropping systems, are generally indicative of associated livestock rearing and of the level of intensity or relative level of inputs being employed. The removal of land in high intensity cropping systems would generally result

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
	The ranking of cropping systems used for the preparation of the map for this factor is as follows: 1. specialty crops 2. row crops and corn-wheat systems 3. mixed, cereal grain, hay-grain and hay (good quality) systems 4. hay (poor quality), pasture and grazing 5. non-agricultural land uses The above ranking orders the crop rotation systems from the highest levels of management inputs to the lowest.	in a higher level of impact on existing farm enterprises than the loss of land in low intensity systems. Similarly, enterprises surrounding a site that are classed as intensive would experience higher levels of impact than would low intensity enterprises.
2.3	Urban shadow areas	
	Areas where the pressures of urbanization have altered the agricultural land base, infrastructure and/or agricultural community sufficiently to place the long term future of the agricultural sector in doubt.	Impacts to the agricultural land base, economy and community are lower on lands undergoing urban-related change than on lands which have been relatively free of such destabilizing pressures.
3.	LAND USE	
3.1	Industrial Lands Designated in Official Plans, Built Upon	
	Lands which have been approved by municipal Official Plan(s) for industrial uses and which have been developed and built upon for industrial purposes.	Industries include those characterized by noise, some airborne emissions, rail and truck traffic, etc. The location of most built-up industrial areas is generally well separated from residential areas. (There are exceptions.)

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
		Most have good road (and in many cases, rail) access. The OWMC facilities, except for the landfill, are essentially industrial in character. Built-up industrial areas contain a variety of industrial and related buildings and uses. Intensity of areas varies greatly, as does parcel size. Siting opportunities occur primarily in terms of replacement of obsolete or low intensity uses and will most likely be feasible only if a single large property is available.
3.2	Industrial Lands Designated in Official Plans - Internal Roads and Services But Not Built Upon Lands designated for industrial use in Official Plans with internal roads and services constructed but not occupied or built upon in industrial uses.	The areas designated for industrial use within the candidate areas are, generally speaking, subject to Official Plan designations that permit a wide range of industrial uses. It can therefore be anticipated that future industries include those characterized by noise, some airborne emissions, rail and truck traffic, etc. The particular significance to internally-serviced industrial land is three-fold; compared with similar land which is unserviced, these areas are ready for immediate development, have a significant infrastructure investment and have a quite different pattern of

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
	land division and ownership from unsubdivided land. Acquisition of parcels of serviced land is expected to be more time-consuming and expensive than would be the case with unserviced land. The OWMC facilities, except for the landfill, are essentially industrial in character. For this reason the OWMC uses will have a substantial degree of suitability to many of the future uses in designated industrial areas.
3.3 Industrial Lands Designated in Official Plans and Vacant These lands have been approved by Municipal Official Plan(s) for industrial uses. However, no development has yet taken place and the lands are vacant. This factor includes both lands designated for industrial use in Area, Municipality and Regional Official Plans.	It can be anticipated that future industries will include those characterized by noise, some airborne emissions, rail and truck traffic, etc. The location of industrial areas is generally well removed from residential areas (there are exceptions). Most have good road (and in many cases, rail) access. The time frame for development of these lands generally can be expected to be much longer term than for already serviced industrial land. It is likely that many of these lands will remain unbuilt for the immediate future. The OWMC facilities, except for the landfill, are essentially industrial in character. For this reason, the OWMC uses will have a substantial degree of suitability to many of the future uses in designated industrial areas.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
3.4	Residential Lands, Designated in Official Plans and Built Upon	
	These are lands which have been approved by municipal Official Plan(s) for residential uses and which have been developed and built upon for residential uses.	Residential uses are not generally be considered compatible with industrial uses. Use of these areas might involve moving existing residences.
3.5	Residential Lands, Designated in Official Plans, Internal Roads and Services but Not Built Upon	
	Lands which have been approved by municipal Official Plan(s) for residential uses and which are currently serviced for development. However, buildings or structures have not been erected.	Residential designations do not normally allow private industrial uses, particularly in suburban areas. Once services are in place, this is a strong commitment for development.
3.6	Residential Lands, Designated in Official Plans, Vacant	
	Lands which have been approved by municipal Official Plan(s) for residential uses. However, no development has yet taken place and the land is vacant.	Residential designations do not normally allow private industrial uses, particularly in suburban areas.
3.7	Residential Development In Rural and Agricultural Areas	
	These are lands which are outside urban areas, but which have been developed for residential purposes.	Clusters of rural residential uses are not generally be considered compatible with industrial uses. Use of these areas might involve moving existing residents.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
	Rural residential uses typically take the form of strip development along highways or local roads and are often inter-mixed with agricultural, commercial and other uses. A minimum of fifteen houses clustered in close proximity was set as the minimum criterion for mapping.	
3.8	Commercial Lands Designated in Official Plans, Built Upon Built upon commercial land, including shopping, office and personal service uses.	Many commercial activities are not generally be considered compatible with industrial uses. Capital investment in commercial areas is generally intensive.
3.9	Residual Lands Within Urban Envelopes, Regional Official Plans Lands within the urban or hamlet development envelopes defined in regional Official Plans but not designated for urban uses in area municipality Official Plans.	The designation of lands within the urban or hamlet development envelopes implies a commitment to a change in land use within the time frame of the plan, usually from an agricultural to an urban use. This planning approach is a feature of the Niagara and Halton Region Official Plans. These designations have not been fully incorporated into all the Area Municipality Official Plans, however, and there remain areas committed to future urban use which do not have a specific urban use designation.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
3.10 Provincial Planning Designation	
Areas Designated Within: a) the Parkway Belt West Planning Area b) the Niagara Escarpment Commission (N.E.C.) Planning Area	These two provincial planning instruments are of significance in the vicinity of Candidate Areas 1-3 and 5. The Parkway Belt designated area limits users to those "compatible" with the Parkway Belt, i.e., essentially agricultural and recreational uses. Transportation, utility and pipeline corridors are also acceptable uses. The N.E.C. Plan controls are aimed at preserving the natural character of the Escarpment and its adjacent scenic areas, and its provisions would seem to preclude OWMC facilities. Both the Parkway Belt and the N.E.C. Plan are recognized as land use categories in the regional and local Official Plans.
3.11 Rural Designations - Official Plans	
Rural designations in area municipality Official Plans which contain both agricultural and rural designations.	Potentially suitable, usually consist of lands with limited and poorer agricultural capability. These designations represent a policy commitment on behalf of the municipality.
3.12 Publicly Owned	
Lands owned by federal, provincial or municipal agencies.	These lands are intended for uses which benefit the population at large. Use of these lands would minimize impacts upon private landowners.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
4. COMMUNITY FACILITIES	
4.1 Regional Hospitals	
These are regionally serving hospitals with specialized facilities and/or emergency capabilities.	These are major, regionally serving health facilities with special siting and accessibility requirements. They contain a large, temporary population of "residential" nature with varying degrees of incapacitation. A regional hospital would not generally be considered compatible with industrial uses.
4.2 Nursing Homes	
These are as defined by The Nursing Home Act, Ministry of Health. Residents require a minimum of one and one-half hours of nursing care daily. The premises are maintained and operated for persons requiring nursing care or in which such care is provided to two or more unrelated persons.	These contain a residential incapacitated population. The majority of residents are elderly. Nursing homes would not generally be considered compatible with industrial uses.
4.3 Homes for the Aged	
These are as defined under the Homes for the Aged Act. Homes are provided for persons over 60 years of age or under special circumstances, those who cannot be cared for adequately elsewhere. They provide residential services and may also have extended care services.	These contain primarily an elderly residential population, with varying degrees of incapacitation. The industrial nature of OWMC facilities is incompatible with the residential nature of Homes for the Aged.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
	The homes may be under a municipal or private board of management jurisdiction.	
4.4	Institutions for the Handicapped	
	These are institutions providing residencial care for handicapped individuals.	These contain residential populations of varying sizes with varying degrees of incapacitation. Such uses would not be considered compatible with industrial uses.
4.5	Special Educational Facilities	
	This factor includes schools for the mentally and physically handicapped, schools for the blind and deaf, and schools for the trainable retarded.	These contain temporary or residential populations, partially incapacitated. Health and welfare of students and staff is a major consideration. There is also a potential for conflict with the industrial nature of OWMC facilities.
4.6	Colleges and Universities	
	This factor includes colleges and universities under the jurisdiction of the Ministry of Colleges and Universities. It includes main and satellite campuses. Also included are facilities such as private vocational schools providing higher education to local and regional communities.	These contain a large temporary or, in some cases, residential population not suitable for location near industrial type facilities. In some instances, size of plant would preclude relocation.
4.7	Schools	
	This factor includes public, private and separate schools at the elementary and secondary levels.	Private schools may have a residential component. Temporary populations of predominantly children are not compatible with the industrial nature of OWMC facilities.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
4.8	Regional Police Headquarters	
	As indicated by name.	These contain substantial temporary populations involved in the safety of regional residents. Accessibility and ability to carry out normal activities and handle emergencies must not be hindered or impaired.
4.9	Regional Shopping Centres	
	This factor includes regionally serving shopping centres, as defined by relevant Official Plans.	These may conflict with OWMC facilities due to the presence of a large, temporary population. The size of such facilities would preclude relocation.
4.10	Correctional Facilities	
	This factor includes correctional institutions, training schools, detention centres and reformatories.	The significance of this factor lies in the residential nature of the population and the special security requirements. Emergency evacuation presents special difficulties. Such facilities are also difficult to relocate.
4.11	Public Buildings	
	The public building factor includes those whose functions serve a larger area than the local community, i.e., court houses, provincial ministry and federal buildings, regional and county government buildings.	These contain large, temporary populations. Such facilities would not generally be considered compatible with industrial uses.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
4.12 Theme Parks	
This factor includes intensely developed parks providing a variety of activities, amusements and entertainment which are centered around a particular theme. The parks cater largely to regional and tourist markets.	These contain a large, temporary population with a large proportion of tourists. Use may or may not be seasonal. There is the potential for disruption to normal activities or loss of revenue. Such facilities would not generally be considered compatible with industrial uses.
4.13 Museums	
This factor includes buildings which store and exhibit objects illustrating natural history, art, agriculture, transportation, sports, etc. It includes museums under the jurisdiction of Parks Canada, Ministry of Natural Resources, Conservation Authorities, municipalities, private boards of management, historical societies, etc.	These contain temporary visitor populations. The cultural and historical significance of museums and their contents could be in conflict with the industrial nature of OWMC facilities.
4.14 Community Centres	
This factor includes centres providing social, recreational and educational facilities for the community. Emphasis is given to community centres serving more than the local population and providing primarily recreational and cultural facilities and opportunities.	The industrial nature of OWMC facilities is in conflict with the population using the community centres and their recreational facilities.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
4.15 Cultural Centres	
This factor includes centres providing cultural opportunities and related facilities for specific groups or the community at large.	These facilities may contain large temporary populations. The potential for disruption of use of facilities is also of significance.
4.16 Municipal Sports Facilities	
This factor includes recreational complexes, fitness centres, swimming pools, arenas and major regionally serving facilities such as sports fields and ball parks under municipal ownership.	Significance lies in the temporary population using the sports facilities and the potential for disruption of use of facilities or loss of recreational opportunities.
4.17 Private Sports Facilities	
This factor includes recreational centres, fitness centres, swimming pools and marinas under private ownership, agencies (such as YMCA) or community group ownership.	The temporary population using the sports facility is of concern as is the potential for disruption of use of facilities or displacement of facilities. The potential for loss of revenue to operators is also of significance.
4.18 Fairgrounds and Exhibitions	
This factor includes fairgrounds and exhibitions under municipal and provincial jurisdiction. It includes agricultural fairs and exhibition grounds used only several times annually as well as those with community and recreational functions used regularly throughout the year.	These attract varying temporary population levels. They may also provide recreational and community facilities and/or a tourist attraction which have potential for disruption.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR	DEFINITION	SIGNIFICANCE
4.19 Conservation Areas	This factor includes lands of any size under the jurisdiction of a conservation authority intended for park or other recreational purposes.	The presence of varying temporary population levels is of concern as is the potential for disruption or displacement of recreational resources.
4.20 Parks	Parks include all those major parks under municipal, regional, provincial, federal, private, agency or community group jurisdiction (excluding conservation areas). The parks may be used for active or passive recreational pursuits with varying degrees of development. Only major parks which serve a broad geographic area were considered at this stage. Community and neighbourhood parks have not been included at this phase.	These are relevant as significant providers of recreational opportunities and facilities for regional residents. Temporary populations are of concern, as well as potential disruption.
4.21 Campgrounds	This factor includes all campgrounds under any ownership. Included are tent and trailer campgrounds, camps for children, adults and other groups and lodges.	These are temporary "residential" facilities. The potential for temporary loss of use of campgrounds, displacement of facilities and loss of revenue is also a consideration.

TABLE A5.1

Constraint Mapping Factors - Definitions and Significance

FACTOR	DEFINITION	SIGNIFICANCE
4.22 Golf Courses	This factor includes all golf courses under municipal, commercial or private ownership.	These are relevant as recreational facilities attracting a seasonal daytime user population. The potential for displacement or disruption of recreational activities is also of significance.

TABLE A5.2

Constraint Mapping Factors - Exclusionary

Factors	Fails to Provide Second Level of Protection	Major Potential Adverse Effects	Difficult to Confirm Suitability	Difficult to Mitigate Impacts	Oct. & Nov.* 1983 Workshop Preferences	Comments
Physical Resources:						
* surface granular soil	0	0		0	0	* could provide potential migration paths for off-site contaminant movement
* stream course	0	0		0	0	* as above
* flood plain	0	0		0	0	* as above
* wetland	0	0		0	0	* as above
* drumlins (Niagara)	0	0		0	0	* as above
* drumlin field			0		0	* as above; difficult to confirm suitability
* moraine			0		0	* as above; difficult to confirm suitability
Land Use:						
* residential built-upon		0		0	0	* significant adverse social and economic impacts; incompatible land use
* residential, designated and serviced		0		0	0	* as above

* For ease of understanding, the factors used at the October and November 1983 workshops were less detailed than those used in the constraint mapping.

TABLE A5.2

Constraint Mapping Factors - Exclusionary

Factors	Fails to Provide Second Level of Protection	Major Potential Adverse Effects	Difficult to Confirm Suitability	Difficult to Mitigate Impacts	Oct. & Nov. 1983 Workshop Preferences	Comments
• commercial, designated and built-upon		0		0		• as above
• residential, existing, rural and agricultural		0		0		• as above
• residential, designated and vacant		0		0		• as above
Recreation and Community Facilities:						
• colleges and universities		0		0	0	• major facilities - difficult to relocate; high temporary and permanent populations; major land use
• special educational facilities		0		0	0	• difficult to relocate or evacuate; high temporary and permanent populations
• homes for the aged		0		0	0	• as above
• nursing homes		0		0	0	• as above
• police headquarters		0		0	0	• major facilities - difficult to relocate; high temporary and permanent populations; major land use

TABLE A5.2

Constraint Mapping Factors - Exclusionary

Factors	Fails to Provide Second Level of Protection	Major Potential Adverse Effects	Difficult to Confirm Suitability	Difficult to Mitigate Impacts	Oct. & Nov. 1983 Workshop Preferences	Comments
• theme parks		0		0	0	• major facilities - difficult to relocate; high temporary and permanent positions; major land use
• regional shopping centres		0		0	0	• as above
• correctional facilities		0		0	0	• as above
• hospitals		0		0	0	• as above
• institutions for handicapped		0		0	0	• as above
Agriculture:						
• existing specialty crops		0		0	0	• major adverse effect; high productivity; limited opportunity for relocation
• Class 1 or 2 row crops and corn-wheat		0		0	0	• high capability/productivity crops
• Class 1 and 2 mixed cereal grain, hay-grain and hay (good quality)		0		0	0	• as above
• Class 3 row crops and corn-wheat		0		0	0	• as above

TABLE A5.2

Constraint Mapping Factors - Exclusionary

Factors	Fails to Provide Second Level of Protection	Major Potential Adverse Effects	Difficult to Confirm Suitability	Difficult to Mitigate Impacts	Oct. & Nov. 1983 Workshop Preferences	Comments
• Class 3 mixed, cereal grain, hay-grain and hay (good quality)		0		0	0	• PI only; less diversity of choice required
• Class 1 or 2, hay (poor quality) pasture and grazing		0		0	0	• PI only; less diversity of choice required
• Class 4, row crops and corn-wheat		0		0	0	• PI only; less diversity of choice required
• Class 4, mixed, cereal grain, hay-grain and hay (good quality)		0		0	0	• PI only; less diversity of choice required

TABLE A5.3

Constraint Mapping Factors - Non-Exclusionary

Factors	1	2	3	4	5	6	7	8*	Comments
Physical Resources									
• till and lacustrine clay plain	0							0	• provides second level of protection
• drumlin (Halton)	0								• provides second level of protection
• poor surface drainage	0		0		0				• mitigation possible, tendency to be less productive agriculturally
Biological Resources									
• SEUs						0	0		• not possible to generalize across class
• non-SEU woodlots greater than 20 ha			0		0	0			• inadequate information for decision-making
Land Use									
• industrially designated and vacant	0							0	• compatible land use
• rural designated	0						0		• considerable variation in significance and suitability; inadequate information for decision-making; potentially suitable
• industrially designated and serviced	0			0				0	• potentially suitable

LEGEND:

1. potentially suitable/compatible
2. easy to confirm suitability
3. needs intensive field investigations
4. needs intensive community dialogue
5. potential for mitigation
6. contributes to diversity of choice
7. difficult to generalize across classes
8. October and November 1983 workshop preferences

*For ease of understanding, the factors used at the October and November 1983 workshops were less detailed than those used in the constraint mapping.

TABLE A5.3

Constraint Mapping Factors - Non-Exclusionary

Factors	1	2	3	4	5	6	7	8*	Comments
° residual, Regional Official Plan							0		° considerable variation in significance and sensitivity - potentially suitable
° industrially designated and built upon	0	0					0	0	° potentially suitable - can be readily confirmed in subsequent stages
Recreation and Community Facilities									
° golf courses	0	0	0	0	0		0	0	° considerable variation in significance and sensitivity - can be readily confirmed in subsequent stages of analysis
° campgrounds	0	0	0	0	0		0		° as above
° museums	0	0	0	0	0		0		° as above
° fairgrounds and exhibitions	0	0	0	0	0		0		° as above

LEGEND:

1. potentially suitable/compatible
2. easy to confirm suitability
3. needs intensive field investigations
4. needs intensive community dialogue
5. potential for mitigation
6. contributes to diversity of choice
7. difficult to generalize across classes
8. October and November 1983 workshop preferences

*For ease of understanding, the factors used at the October and November 1983 workshops were less detailed than those used in the constraint mapping.

TABLE A5.3

Constraint Mapping Factors - Non-Exclusionary

Factors	1	2	3	4	5	6	7	8*	Comments
° municipal, regional and private parks	0	0	0	0	0		0		° considerable variation in significance and sensitivity - can be readily confirmed in subsequent stages
° conservation areas	0	0	0	0	0		0		° as above
° municipal sports facilities	0	0	0	0	0		0		° as above
° private sports facilities	0	0	0	0	0		0		° as above
Agriculture									
° Class 5, 6 or 7	0							0	° potentially suitable
° Class 3 or 4 in non-agricultural uses	0					0			° relatively less suitable agriculturally - potentially suitable in subsequent stages

LEGEND:

1. potentially suitable/compatible
2. easy to confirm suitability
3. needs intensive field investigations
4. needs intensive community dialogue
5. potential for mitigation
6. contributes to diversity of choice
7. difficult to generalize across classes
8. October and November 1983 workshop preferences

*For ease of understanding, the factors used at the October and November 1983 workshops were less detailed than those used in the constraint mapping.

TABLE A5.3

Constraint Mapping Factors - Non-Exclusionary

Factors	1	2	3	4	5	6	7	8*	Comments
° Class 1 or 2 - non-agricultural use	0					0			° relatively less suitable agriculturally - potentially suitable in subsequent stages
° Class 3 or 4 hay (poor quality), pasture and grazing						0			° preferably not but retain to maintain diversity of choice
° Class 4 - mixed, cereal grain, hay-grain and hay (good quality)						0			° as above - only pertains to landfill
° Class 4 - row crops and corn-wheat						0			° as above - only pertains to landfill
° Class 1 or 2 - hay (poor quality), pasture and grazing						0			° as above - only pertains to landfill
° Class 3 - mixed, cereal-grain, hay-grain and hay (poor quality)						0			° as above - only pertains to landfill

LEGEND:

1. potentially suitable/compatible
2. easy to confirm suitability
3. needs intensive field investigations
4. needs intensive community dialogue
5. potential for mitigation
6. contributes to diversity of choice
7. difficult to generalize across classes
8. October and November 1983 workshop preferences

*For ease of understanding, the factors used at the October and November 1983 workshops were less detailed than those used in the constraint mapping.

THE IDENTIFICATION OF POTENTIAL SITES (SITE SCREENING)

The "screening" stage began after constraint mapping had identified constraint-free areas. As described in Chapter 5 of the Phase 3 Report the site area screening process took place in a series of steps with site areas being either dropped from consideration or reduced in size at each step. Different criteria were applied at each step in the screening process. The rationale associated with the rejection of each site area is specified in Table A5.4. Whenever there was any uncertainty regarding the suitability of a site area, the site area was retained for further consideration.

The screening process reduced the number of potential sites to 16 - 10 landfills and 6 PI sites. Of the 10 landfill sites, 2 were considered suitable only as landfills, 3 were considered suitable only as fully integrated sites and 5 were considered suitable as either landfills or as fully integrated sites.

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
North Landfill												
LF-1A1		0		0								° existing serviced industrial development in southern portion of site area ° insufficient site area remaining
LF-2A1	0	0				0						° flood plain in southwest corner of site area ° Mayfield Secondary School Recreational Complex located on the northwest boundary of the site area ° church under construction on the west boundary of the site area ° insufficient site area remaining
LF-1N	0	0					0					° insufficient site size

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° stream course in south portion of site area ° Regional Roads 22 and 6 to the west and south, CNR to the east and the candidate area boundary to the north limit border the site area
LF-3N	0	0					0					° bisected by Highway 410 ° an existing serviced industrial park is located between Highway 410 and Tomken Road ° east of Highway 410 a moraine occurs in southern portion of site area ° insufficient site area remaining
LF-5N	0						0					° bisected by Regional Road 6 and a high pressure oil pipeline ° irregular shape ° insufficient site area remaining

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
West Landfill												° bordered by stream courses to the west and east and the candidate area boundary to the north and south.
LF-1W					0							° confirmation of agricultural land classification - Class 1 or 2 row, crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
LF-2W	0	0				0						° flood plain on north and south portions of the site area ° a number of wetland areas within the site area ° Seneca Unity Elementary School on north boundary of site area ° insufficient site area remaining ° in close proximity to a drumlin (composed of Wentworth Till)

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
LF-3W					0							° confirmation of agricultural land classification - Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
LF-4W	0	0		0		0						° flood plain dissects site area ° moraine possible on north portion of site area ° insufficient site area remaining ° residential designated land adjacent to west boundary of site area and candidate area boundary to south and east border the site area ° close proximity to Binbrook and several community facilities
LF-5W	0	0										° flood plain dissects site area ° insufficient site area remaining ° drumlin field to east ° Class 1 or 2 row crops, corn-wheat; Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality); Class 3

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												row crops, corn-wheat to the south and west and specialty crops to the north
LF-6W					0							° confirmation of agricultural land classification - Class 1 or 2 row crops, corn-wheat; Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality); Class 3 row crops, corn-wheat
LF-7W					0							° confirmation of agricultural land classification - Class 1 or 2 row crops, corn-wheat; Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
LF-8W					0							° confirmation of agricultural land classification - Class 1 or 2 row crops, corn-wheat and Class 3 row crops, corn-wheat

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
LF-9W					0							° confirmation of agricultural land classification - Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain hay-grain and hay (good quality)
LF-12W	0											° insufficient site size ° bounded by on all sides by Class 1 or 2 row crops, corn-wheat
LF-13W		0	0									° many wetland areas on-site ° immediately adjacent to Significant Environmental Unit (SEU) 17-1; SEU 17-1 and its buffer lie within the site area ° in close proximity to a drumlin field ° candidate area boundaries to the west and south ° Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) to the east and north

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
LF-14W	0	0										° insufficient site size ° bordered by drumlin field to south and west ° bordered by Class 1 or 2 row crops, corn-wheat and Class 3 row crops, corn-wheat
Central Landfill												
LF-2C				0		0	0					° village residential designation abutting buffer ° close proximity to Wainfleet ° transportation access very indirect
LF-4C	0		0				0					° irregular shape ° conflict with SEU 18-27 ° insufficient site size ° CNR line to south and Con.Rail line to north
LF-5C	0					0	0					° insufficient site size

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° CNR line to the north, Regional Road 23 to the south and rural residential units on Regional Road 23 to the east and west border the site area
LF-6C	0	0	0			0						° conflicts with SEU 18-13 ° large wetland area within site area ° flood plain (Little Forks Creek) within site area ° residential cluster on northeast portion of site area ° insufficient site area remaining
LF-7C	0		0				0					° conflicts with SEU 18-9 ° crossed by THBR line in the north section ° insufficient site area remaining ° candidate area boundary to the north, east and south ° proximity to residential cluster and Hamlet of Boyle to west and south

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
LF-10C	0		0				0					° insufficient site area ° SEU 18- 5, 18- 8 ° remaining area with LF-9C
LF-11C	0											° insufficient site size ° hydro lines to the south ° candidate area boundary to the north ° bordered by Class 1 or 2 row crops, corn-wheat; Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) and Class 3 row crops, corn-wheat
LF-12C	0	0	0									° very irregular shape ° wetland area in west portion of site area ° SEU 9-2 to west ° candidate area boundary to north ° hydro lines to south ° bordered by Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
LF-13C	0		0			0	0					° residential concentration (Caistor Centre) in west portion of site area ° SEU 9-2 in north portion of site area

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° site area bisected by Regional Road 65 and hydro lines ° insufficient site area remaining ° candidate area boundary to south
LF-14C	0		0									° conflicts with SEU 18-18 ° insufficient site size remaining
LF-15C			0			0	0					° conflicts with SEUs 18-14, 18-15 and 18-16 ° bisected by CNR line and Conrail line ° residential cluster within site area and along north portion of site area ° candidate area boundary to south ° bordered by Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
LF-16C					0							° confirmation of agricultural land classification Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
LF-17C	0		0									° insufficient site size ° western portion of SEU 18-7 on-site ° Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) to east, west and south
LF-18C	0						0					° irregular site shape ° crossed by Regional Road 27 ° insufficient site area remaining ° bordered by Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
LF-19C	0		0				0					° conflicts with SEU 18-3, 18-4 and 18-7 ° east portion crossed by Highway 20 ° insufficient site area remaining ° bordered by Class 1 or 2 row crops, corr-wheat, and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
LF-20C	0		0									° conflicts with SEUs 9-3 and 18-5 ° insufficient site area remaining ° candidate area boundary to the north ° bordered by Class 1 or 2 mixed, cereal grain and hay-grain and hay (good quality) and Class 3 row crops, corn-wheat to the east
LF-21C	0		0									° conflicts with SEUs 18-6 and 8-8 ° insufficient site area remaining
LF-22C	0		0				0					° conflicts with SEUs 18-2, 18-3 and 18-6 ° bisected by THBR line ° insufficient site area remaining ° bordered by candidate area boundary to north ° Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality), to the east, south and west
LF-23C	0	0	0									° conflicts with SEU 18-4

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° wetland area in site area and to west of site area ° insufficient site area remaining ° bordered by Highway 20 to the south
LF-24C	0											° insufficient site size ° bordered by Class 1 or 2 row crops, corn wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
LF-25C	0	0			0							° poorly drained site, a number of wetland and drainage swales on site ° potentially severe impact on agricultural operations ° insufficient site area remaining ° bordered by SEUs 18-4 and 18-5 to the northeast and west ° Highway 20 borders south portion of site area ° bordered by Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen							Compatibility Screen		System Screen		Comments
	1	2	3	4	5	6	7	8	9	10	11	
LF-26C	0		0									° conflicts with SEU 18-1 ° insufficient site area remaining
LF-27C	0						0					° insufficient site size ° crossed by hydro lines to the south and Regional Road 65 ° bordered by Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) ° bordered by candidate area boundary to south
LF-28C	0		0				0					° conflicts with SEU 8-5 ° hydro lines crosses north portion of site ° insufficient site area remaining ° bordered by candidate area boundary to south ° bordered by Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
LF-29C	0											° insufficient site size ° bordered by Class 1 or 2 row crops, corn-wheat, and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
LF-30C	0											° insufficient site size ° bordered by Class 1 or 2 row crops, corn-wheat, and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
LF-31C	0						0					° insufficient site size ° bisected by hydro lines
LF-32C	0						0					° insufficient site size ° bisected by hydro lines
East Landfill												
LF-2E		0	0									° spoil piles within site area ° part of SEU 18-28 occurs within site area

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen							Compatibility Screen		System Screen		Comments
	1	2	3	4	5	6	7	8	9	10	11	
LF-4E	0		0		0							° confirmation of agricultural land classification Class 1 or 2 row crops, corn-wheat; Class 1 or 2 mixed, cereal grain, hay-grain hay (good quality) and Class 3 row crops, corn-wheat ° conflicts with SEU 19-5 ° insufficient site size remaining ° bordered by SEUs 19-4 and 19-6 to the north and south ° bordered by Regional Road 98 to the east side
LF-5E	0		0									° conflicts with SEU 19-6 ° insufficient site size remaining ° bordered by candidate area boundary to south and west ° bordered by Regional Road 98 to the east
LF-6E	0	0		0								° spoil piles within site area ° factory within site area ° insufficient site area remaining

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° bordered by Welland Canal to the east, CNR line to the north and a ConRail line to the south ° residential cluster located to the north of the site area
LF-7E	0	0				0						° spoil piles within site area ° insufficient site area remaining ° Dain City residential concentration borders south portion of site area ° ConRail line and Welland population concentration to north ° Welland Canal to east and west
LF-8E	0	0					0					° spoil piles within site area ° insufficient site area remaining ° population concentrations to north and south ° bisected by Highway 58 to east and ConRail line to north, CNR line to south ° candidate area boundary to south

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
LF-9E	0		0				0					° conflicts with SEU 13-8 ° bisected by QEW ° insufficient site area remaining ° candidate area boundary to north, east and south ° flood plain to west
LF-10E	0		0				0					° conflicts with SEU 19-1 ° bisected by Regional Roads 47 and 84 ° insufficient site area remaining ° bordered by flood plain to north and south ° bordered by candidate area boundary to west
LF-11E	0		0									° conflicts with SEU 18-26 ° insufficient site area remaining
LF-12E	0		0			0						° insufficient site area ° residential cluster within site area ° conflicts with SEU 13-8 to the east

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
North Partially Integrated												° stream course and Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) to the west
PI-3A1						0		0	0	0		° Mayfield Secondary School/Recreation Complex located on the northwest boundary of the site area ° industrial nature of PI facility is not compatible with rural designation ° industrially designated PI sites located closer to a suitable landfill
PI-3N	0	0				0	0					° potential conflict with Pearson International Airport ° moraine in south portion of site area

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° residential cluster in north portion of site area ° insufficient site area remaining ° flood plain to the west of site area ° site area bordered by Highway 10 to east
PI-4N							0					° potential conflict with Pearson International Airport
PI-5N							0					° potential conflict with Pearson International Airport
PI-6N							0					° potential conflict with Pearson International Airport

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-7N	0						0					° insufficient site area ° bisected by Regional Road 6 ° bordered by flood plain to the east and west ° candidate area boundary to the north and east
PI-8N	0											° irregular site shape ° insufficient site area ° bordered by flood plain to the west and a gas pipeline to the east ° bordered by the candidate area boundary to the south and by residential concentrations to the north
PI-9N							0					° potential conflict with Pearson International Airport
PI-10N				0								° site with similar characteristics, but publicly owned is located in the same vicinity

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-11N							0					° site area bisected by proposed Dorval Way
PI-12N							0					° site area bisected by proposed Dorval Way
PI-15N				0		0						° potential long term conflict with future residential areas ° potential constraint - sensitive receptors (Milton)
West Partially Integrated												
PI-1W					0							° confirmation of agricultural land classification Class 1 or 2 row crops, corn-wheat, Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
PI-3W	0											° insufficient site size ° candidate area boundary to the west and north ° flood plain to the east and north ° Six Nations Indian Reserve to the south

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-4W	0					0	0					° irregular site area shape ° bisected by hydro lines ° residential cluster in north portion of site area ° insufficient site size ° in close proximity to Hamilton Civic Airport
PI-5W	0		0									° conflicts with SEU 7-1 ° insufficient site size remaining
PI-6W					0							° confirmation of agricultural land classification, Class 1 or 2 row crops, corn-wheat and Class 3 row crops, corn-wheat
Central Partially Integrated												
PI-1C						0						° population concentration (Smithville) immediately to south of site area ° private school within 400 m of site area ° hydro lines to north of site area

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-2C	0		0			0						° insufficient site size ° population concentration (Caistor Centre) to west ° SEU 8-7 occurs within site area ° bordered by Regional Road 65 and hydro lines to north
PI-3C	0		0			0						° conflicts with SEUs 18-15 and 18-16 ° population concentration to east ° insufficient site area remaining
PI-4C	0		0			0	0					° conflicts with SEU 8-6 ° bisected by hydro lines and Regional Road 65 ° insufficient site area remaining ° population concentration (Abingdon) to north ° bordered by Class 1 or 2 row crops, corn-wheat, Class 3 or 4 row crops, corn-wheat, Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) and Class 3 or 4 mixed, cereal grain, hay-grain and hay (good quality)

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-5C	0		0									° conflicts with SEU 8-5 ° insufficient site area remaining ° bordered by Class 1 or 2 row crops, corn-wheat, Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality), Class 1 or 2 hay (poor quality), pasture and grazing
PI-6C	0		0									° conflicts with SEU 9-2 ° insufficient site area remaining ° bordered by Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
PI-7C	0						0					° irregularly shaped ° bisected by hydro lines and Regional Road 65 ° insufficient site area remaining
PI-8C	0		0									° conflicts with SEU 8-8 ° insufficient site area remaining ° bordered by Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen							Compatibility Screen		System Screen		Comments
	1	2	3	4	5	6	7	8	9	10	11	
PI-9C	0		0				0					° conflicts with SEU 18-2 ° bisected by THBR line and Regional Road 16 ° insufficient site area remaining ° bordered by Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
PI-10C	0		0									° conflicts with SEU 18-4 ° insufficient site area remaining ° bordered by wetland area, Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) and Class 1 or 2 hay (poor quality), pasture and grazing
PI-11C	0					0						° population concentrations to north and west ° insufficient site area remaining ° bordered by Class 1 or 2 row crops, corn-wheat, Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) and Class 3 or 4 mixed, cereal grain, hay-grain and hay (good quality)

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-12C	0		0									° conflicts with SEU 18-8 ° insufficient site area remaining ° bordered by candidate area boundary to the north and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality), Class 1 or 2 hay (poor quality), pasture and grazing and Class 3 or 4 mixed, cereal grain and hay-grain and hay (good quality)
PI-13C	0		0				0					° conflicts with SEU 18-9 ° bisected by THBR line ° insufficient site area remaining ° bordered by candidate area boundary to the north and Class 3 or 4 mixed, cereal grain, hay-grain and hay (good quality)
PI-14C	0		0				0					° conflicts with SEU 18-8 ° insufficient site area remaining

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° bordered by Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) ° indirect transportation access
PI-15C					0		0					° conflict with nearby specialty crops ° indirect transportation access
PI-16C			0				0					° potential conflict with Welland Airport ° conflicts with SEUs 18-25 and 18-27
PI-17C	0		0				0					° potential conflict with Welland Airport ° irregular site area shape ° conflicts with SEU 18-27 ° bisected by ConRail to the north and CN rail to the south
PI-18C	0		0									° conflicts with SEU 8-5 ° insufficient site area remaining

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° bordered by residential clusters to the north and by Class 1 or 2 row crops, corn-wheat and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
PI-19C								0	0			° industrially designated site more compatible
PI-20C	0		0									° conflicts with SEU 18-1 ° insufficient site area remaining ° bordered by Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality)
PI-21C								0	0			° industrially designated site more compatible
PI-22C								0	0			° industrially designated site more compatible
PI-23C	0		0				0					° conflicts with SEU 18-5 ° bisected by Highway 20 ° insufficient site area remaining

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° bordered by candidate area boundary to east and Class 1 or 2 row crops, corn-wheat, Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality) and Class 1 or 2 hay (poor quality), pasture and grazing
PI-24C	0		0			0						° conflicts with SEU 18-14 ° residential concentration (Perry) to the south ° insufficient site area remaining ° bordered by Class 3 or 4 row crops, corn-wheat
PI-25C								0	0			° industrially designated site more compatible
PI-26C								0	0			° industrially designated site more compatible
East Partially Integrated												
PI-1E			0			0				0	0	° conflict with SEU 13-3 ° industrially designated site located closer to suitable landfill

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen							Compatibility Screen		System Screen		Comments
	1	2	3	4	5	6	7	8	9	10	11	
PI-2E			0			0				0	0	° close proximity to community facilities and population concentrations ° indirect access ° conflict with SEU 13-3 ° industrially designated site located closer to suitable landfill ° close proximity to residential cluster ° indirect access
PI-3E	0	0	0			0						° insufficient site area remaining ° flood plain at north and south portions of site area ° conflicts with SEU 13-2 in west portion of site access ° population concentrations adjacent to east portion of site area ° private campground within 400 m of site area
PI-4E										0	0	° industrially designated site located closer to suitable site ° indirect access

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-5E						0	0			0	0	° site area bisected by hydro corridor, high pressure oil pipeline ° site bordered by population concentration (Port Robinson) ° B.F. Goodrich plant to east ° CNR line to north ° Welland River to south ° industrially designated site located closer to suitable landfill ° indirect access
PI-6E			0					0	0			° agricultural designation ° industrially designated site more compatible ° conflicts with SEU 19-2
PI-7E	0		0									° irregular shaped site area ° conflicts with SEU 19-2; SEU 13-6 borders eastern portion of site area ° insufficient site area remaining ° bordered by ConRail line to east and hydro line to north

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-8E	0	0										° flood plain bisects site ° insufficient site area remaining ° candidate area boundary to west
PI-9E								0	0			° agricultural designation ° industrially designated site located closer to suitable landfill
PI-10E								0	0			° agricultural designation ° industrially designated site located closer to suitable landfill
PI-11E				0		0		0	0			° agricultural designation ° south portion of site area industrially designated, however, immediately adjacent to population concentration (Stevensville) ° industrially designated site located closer to suitable landfill
PI-12E								0	0			° rural and open space designations ° industrially designated site located

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												closer to suitable landfill
PI-13E			0					0	0			° SEU 13-13 occurs within site area ° rural designation ° industrially designated site located closer to suitable landfill
PI-14E			0					0	0			° conflicts with SEU 13-13 ° rural designation ° industrially designated site located closer to suitable landfill
PI-15E	0		0			0						° irregular site shape ° conflicts with SEU 13-13 ° insufficient site area remaining ° bordered by ConRail line to north and CNR line to south ° population concentration (Stevensville) to west
PI-16E			0			0		0	0			° rural designation ° industrially designated site located closer to suitable landfill

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° conflicts with SEU 13-13 at eastern boundary of site area ° close proximity to population concentration (Stevensville)
PI-17E								0	0			° rural designation ° industrially designated site located closer to suitable landfill site
PI-19E	0	0				0						° north portion of site area contains spoil piles ° population concentrations occur on the south and east boundaries of the site area ° insufficient site area remaining ° bordered by Welland Canal to west, Highway 140 to east, ConRail line to north and a wetland area to the south
PI-20E								0	0			° agricultural designation ° industrially designated site more compatible with suitable landfill

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-21E			0					0	0			° agricultural designation ° industrially designated site more compatible with suitable landfill ° conflicts with SEU 18-28 within south-eastern portion of site area
PI-22E	0					0						° insufficient site size ° residential clusters to north and east ° Highway 58 borders west side of site area ° candidate area boundary borders south portion of site area
PI-23E	0		0				0					° conflicts with SEU 13-11 ° south portion bisected by QEW ° insufficient site area remaining ° candidate area boundary to the north and east ° Class 3 or 4 row crops, corn-wheat and Class 3 or 4 mixed, cereal grain, hay-grain and hay (good qualiy), border the site area to the south and west

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-24E	0		0									° conflicts with SEU 13-10 ° insufficient site area remaining ° QEW and flood plain border site area on south, east and north ° candidate area boundary borders on east side
PI-25E	0		0				0					° conflicts with SEU 13-8 ° high pressure oil pipeline and QEW bisect site area ° insufficient site area remaining ° flood plain borders northwest portion of the site area ° residential clusters to the east and north
PI-26E			0									° conflicts with SEU 19-2 and 19-3, SEU 13-6 occurs at and within eastern boundary ° industrially designated site more compatible with suitable landfill

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
PI-28E	0	0				0						° insufficient site area ° abutted by existing residential to south and flood plain to north
PI-29E	0		0				0					° irregular site area shape ° bisected by QEW ° conflicts with SEU 13-8 ° insufficient site area remaining ° site area bordered by residential clusters to north
PI-30E			0				0					° conflicts with SEU 19-1 ° bisected by Regional Roads 47 and 84 ° insufficient site area remaining ° bordered by candidate area boundary to west and south, residential clusters to the north and a stream course to the east
PI-31E			0					0	0			° rural designation ° industrially designated site located closer to suitable landfill

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° conflicts with SEU 13-14 in south portion of site area
PI-32E	0		0									° conflicts with SEU 13-8 ° remaining area irregularly shaped ° insufficient site size remaining
PI-33E	0		0									° conflicts with SEU 19-6 ° irregular shape ° insufficient site area remaining
PI-34E	0	0		0			0					° existing industrial facilities within site area ° irregular shape ° bisected by CN rail and Highway 58 ° spoil piles within site area ° insufficient site area remaining
PI-35E	0		0									° conflicts with SEU 18-26 ° insufficient site area remaining ° site area bordered by Class 1 or 2 row crops, corn-wheat
PI-36E	0						0					° bisected by Regional Road 29

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

TABLE A5.4

Summary Analysis - Site Screening

Sites	Suitability Screen 1	2	3	4	5	6	7	Compatibility Screen 8	9	System Screen 10	11	Comments
												° insufficient site area remaining ° bordered by population concentration (Welland) and candidate area boundary to north and east ° bordered by flood plain and SEU 18-26 to the south
PI-37E	0		0									° insufficient site size ° bordered by residential cluster to north, SEU 13-8 to north and east and Class 1 or 2 mixed, cereal grain, hay-grain and hay (good quality), Class 1 or 2 hay (poor quality), pasture and grazing and Class 3 or 4 row crops, corn-wheat to the west and south

LEGEND: 1 - Size
2 - Hydrogeology
3 - Biology
4 - Land Use
5 - Agriculture
6 - Social
7 - Transportation
8 - Existing Land Use
9 - Designated Land Use
10 - Travel Distance
11 - Access Routes - Sensitive Uses

THE COMPARISON OF POTENTIAL SITES AND IDENTIFICATION OF CANDIDATE SITES

The initial comparative evaulation process began after the screening process had reduced the number of potential site areas to 16 - 10 landfills and 6 physical/chemical/treatment incinerator plants. These sixteen sites were combined into 8 integrated and 9 partially integrated siting options.

The purpose of the initial comparative evaluation stage was to explore the relative differences among the siting options in order to further reduce the number of potential candidate sites under consideration. A siting option represents either a fully-integrated facility or a partially-integrated facility, e.g., separate landfill.

Factors used to compare the siting options have been subdivided into a longer list of indicators. Definitions of each of these indicators as well as a brief description of the significance of each, is provided in Table A5.5.

The first step in the comparative evaluation process was the preparation of detailed matrices specifying the relative differences among the siting options for over 100 indicators. The matrices, together with the composite site vicinity and access road maps were then reviewed and analyzed to synthesize the large number of very specific differences among the siting options into an overall picture of the major constraints and opportunities associated with each option. These major differences are highlighted in Table A5.6.

The initial comparative evaluation resulted in the retention of 8 siting options - 3 integrated and 5 partially integrated options. The integrated-options retained are:

- o LF-1E
- o LF-9C
- o LF-3C

The partially-integrated options retained are:

- o LF-2N with PI-13N
- o LF-2N with PI-1N
- o LF-4N with PI-1N
- o LF-4N with PI-13N
- 0 LF-1E with PI-27E

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
1. Factors on Site	
1.1 HUMAN ENVIRONMENT	
1.1.1 Existing Residents	
i) Number of People Displaced (Estimated Population)	
This indicator is an estimate of the number of people who reside within the bounds of a designated candidate site and who would be required to move if a facility were located there.	Those sites where few people would be displaced were seen as more desirable than sites where many people would be displaced.
ii) Number of Residences Displaced	
The number of residences is the number of housing units, both farm and non-farm related.	Number of residences displaced is the most easily measured indicator of the amount of personal dislocation to be anticipated in the selection of any site.
1.1.2 Existing Resources	
i) Existing Farm Infrastructure	
Farm infrastructure refers to the complex of farm buildings, i.e. barns, storage sheds, silos, grain bins, manure storage, etc. The total number of farm buildings rated average and above average were totalled for each site alternative.	The nature, size and condition of farm building complexes is indicative of the relative value of existing farm infrastructure that would be impacted through acquisition of all, or parts of farm units. The characteristics of such facilities are also indicative of the relative strength of existing agricultural activity within the sites and adjacent to the sites. Impacts will generally be greater in areas with a higher infrastructure investment.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
ii)	Existing Cropping Systems - Land Cultivated	
	This indicator measures the amount of land within the site area which is currently utilized for cultivated crops.	The indicator helps to differentiate between sites which may be of similar soil capability but which may have a high degree of present utilization versus a high proportion of idle or forested land. Impacts are potentially higher to sites with a high proportion of land that is in use for agricultural production.
iii)	Land Fragmentation and Intrusion by Non-Agricultural Land Uses	
	This indicator measures the number of land holdings within the site acquisition area which are less than 50 acres in size and the number of residences, both farm and non-farm related.	The number of land holdings less than 50 acres serves as an indicator of the degree of fragmentation of land parcels into small ownership which increases the difficulty of maintaining land in long-term commercial agricultural production. The number of residences indicates the degree to which agricultural use of the open lands may be constrained by conflicts with adjacent non-farm residents. The potential effects on the agricultural resource base of a facility siting will be higher in an area where agriculture is the predominant use. In those areas where there has been a relatively high level of non-agricultural intrusions, the potential impacts on agriculture would generally be less.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
iv)	Historical Resources	
	These include sites and buildings of historical significance such as houses, farms, mills, factories, stores and shops as identified by historic plaque signs and preliminary field investigations. Only buildings constructed prior to 1900 were identified. It is also possible that some heritage features might not have been recognized as being of historical importance due to structural changes.	The number and significance of historical resources with potential significance were noted. Since such resources are a reflection of the past culture and character of an area, sites with no historical resources or sites where historical resources could be relocated were viewed as more desirable.
v)	Archaeological Resources	
	The number and significance of native (pre-1650) archaeological sites and Euro-Canadian (pre-1867; non-standing) historic sites were noted in the analysis of archaeological resources. Areas of high archaeological potential were also identified.	It is important to identify significant archaeological sites so that they might be avoided. The identification of areas with high archaeological potential "flag" areas where archaeological sites might be discovered during a detailed field investigation.
vi)	Aquifer Distribution (Groundwater)	
	Aquifers are geologic units or formations which are sufficiently porous and permeable to supply groundwater at a continuous rate.	The presence of an aquifer should not necessarily be considered to be a constraint to facility siting. While lands underlain by major aquifers could be given a lower priority for facility siting, particularly where other equally suitable lands are present that are not underlain by such aquifers, it

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
	should be noted that even a marginal aquifer can represent a sole source of water for individuals in a specific area. The potential for aquifer contamination is dependent on a larger number of interrelated factors (e.g. local groundwater movement patterns and velocity, ambient groundwater quality and existing and potential water use). All of these factors will be assessed on a site specific basis. Only the presence/absence of aquifers can be considered during the initial comparative evaluation.
1.1.3 Existing Community and Recreation Facilities	
i) Public Community Facilities	
Those facilities under public jurisdiction and which provide educational, health and safety, correctional and government services to a municipality are included in this category. Examples include schools, police and fire stations.	These facilities may contain temporary or residential populations, some incapacitated, and are generally not compatible with the industrial nature of OWMC facilities. In many cases these facilities would be difficult to relocate.
ii) Public Recreational Facilities	
This indicator includes those facilities under public jurisdiction which provide recreational and leisure opportunities for residents. Facilities such as parks, fairgrounds, museums, community and cultural centres were considered in this category.	These facilities involve a large number of temporary users or in some cases tourists. The potential for loss of recreational opportunities, disruption to the use of the facilities or the loss of revenue are undesirable. Such facilities would not generally be considered compatible with industrial uses.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
iii)	Private Community Facilities	
	Those facilities under private jurisdiction and which provide educational, commercial and health services to a community are included in this category. Examples include churches, homes for the aged, and local shopping centres.	These facilities may contain temporary or residential populations, some incapacitated, and are generally not compatible with the industrial nature of OWMC facilities. In other cases, these facilities provide essential services to the community. Generally, most of these facilities would be difficult to relocate.
iv)	Private Recreational Facilities	
	This indicator includes a preliminary list of those facilities under private ownership and operation which provide recreational and leisure opportunities for community residents. Facilities such as museums, sports complexes, golf courses and arenas were considered in this category.	These facilities could involve a large number of temporary users or in some cases tourists. The potential for loss of recreational opportunities, disruption to the use of the facilities or the loss of revenue are undesirable. Such facilities would not generally be considered compatible with industrial uses.
1.1.4	Existing Commercial and Industrial Uses	
i)	Commercial Facilities	
	The number and type of existing commercial uses including shopping centres, stores, offices and personal service uses were considered.	Most commercial activities would not generally be considered compatible with heavy industrial uses. Capital investment in commercial areas is generally intensive.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
ii)	Industrial Facilities	
	The number and type of existing light, medium and heavy industrial uses were considered. Industrial uses are generally characterized by noise, some airborne emissions, rail and truck traffic, etc.	The location of most built-up industrial areas is generally separated from residential uses. Most have good road access. The OWMC facilities, except for the landfill, are essentially industrial in character. Built-up industrial areas contain a variety of industrial and related buildings and uses. Intensity of areas varies greatly, as does parcel size. Siting opportunities occur primarily in terms of replacement of obsolete or low intensity uses and will most likely be feasible only if a single large property is available.
1.1.5	Future Residents	
i)	Projected Population Levels	
	An estimate of projected population levels is expressed in terms of persons or housing units, as set out in the land use plan or policies of the area municipality Official Plan or secondary plan.	OWMC facilities, except for the landfill, are industrial in nature and as such are characterized by noise and rail and truck traffic. Such facilities are generally not compatible with populated residential areas.
ii)	Approved Residential Plans of Subdivision	
	These include plans for residential subdivisions that have municipal and provincial approval and that will be built at some point in the future.	OWMC facilities are not compatible with residential built-up areas. Approved plans indicate a commitment for development.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
iii)	Residential Designation (Official Plan)	
	Lands which have been approved by area municipality Official Plans for residential uses, which may or may not be presently developed. In some cases lands have been approved by municipal Official Plans for future residential uses, however, are at present vacant.	Residential uses would not generally be considered compatible with industrial uses. Uses of these areas may involve moving existing residences. Residential designations do not normally allow private industrial uses.
iv)	Residential Zoning	
	This includes lands that have been zoned for residential uses in municipal zoning by-laws.	Areas zoned residential do not normally allow private industrial development.
v)	Residential Development Proposals	
	These include applications for planning approval of development including Official Plan amendments, draft plans of sub-division rezoning applications which are pending with the relevant area municipality, regional municipality, or are awaiting approval or decision by the Minister of Municipal Affairs and Housing or the Ontario Municipal Board.	Any proposals for future residential development will generally be in proximity to existing residential uses. The location of an industrial use in an area with potential for residential development is generally undesirable.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
1.1.6	Future Resources	
i)	Class 1 Equivalents	
	This is a measure of the acreage of land which is equivalent to Class 1 capability. The Class 1 equivalent measure is a means of comparing land capabilities on sites which contain more than one capability class.	Class 1 land is potentially the most productive for common field crops. Class 1 equivalents serve as a measure of the potential for future sustained agriculture production from the soil resource base. The lower the Class 1 equivalent acreage, the lower the potential for agricultural production. A goal of the site selection process is the minimization of impact on viable or potential agricultural operations.
ii)	Land Use Designation	
	Official Plan designations for the site is an indication of the community's intentions in the short to medium term future for appropriate land uses. Relevant designations may include rural, agricultural or industrial.	Lands which are designated rural or agricultural have long-term opportunity to realize the potential of the land resource base for agriculture. Where the designation is industrial, the assessment of impacts on future resources is achieved by eliminating from consideration the acreage of Class 1 equivalent lands since they are destined to be converted to a non-agricultural use.
1.1.7	Future Commercial and Industrial Uses	
i)	Planned and Proposed Commercial Facilities	
	This indicator includes a preliminary list of planned and proposed commercial facilities including shopping centres, offices and personal services.	Most commercial activities would not generally be considered compatible with heavy industrial uses. Capital investment in commercial areas is generally intensive.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
ii)	Planned and Proposed Industrial Uses	
	This indicator includes a preliminary list of planned and proposed industrial uses which are generally characterized by noise, some airborne emissions, rail and truck traffic, etc.	Planned and proposed industrial uses will generally be located away from residential uses. The OWMC facilities, except for the landfill, are essentially industrial in character and as such may be suitably located in proximity to other industrial uses. Plans and proposals for future industrial uses serve as an indicator of the industrial potential for a given area.
1.2	PHYSICAL AND BIOLOGICAL ENVIRONMENT - SITE AND SITE VICINITY	
1.2.1	Hydrogeology	
i)	Regional Category	
	Regional category refers to a delineation of areas which share common geologic and hydrogeologic characteristics. Categories 1,2 and 3 and 4 were employed in a hydrogeologic mapping of the Golden Horseshoe in Phase 3a. Categories 1 and 2 are further subdivided into 1a, 1b, 1c and 2a and 2b based on depth of materials.	Generally Category 1 is composed of silt-clay soils with lateral and vertical textural uniformity which range from 10 metres to over 30 metres in depth. This hydrogeological setting should provide natural containment. Category 2 is generally comprised of at least 10 m of silt-clay soils which may be locally intermixed with sand. This hydrogeological setting may provide only local natural containment. Categories 3 and 4 are generally comprised of a variety of geologic materials of variable thickness.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
		From a hydrogeological perspective Category 1 has the most suitable conditions for the siting of a special waste management facility. Category 2 lands may be locally suitable and Category 3 and 4 lands are considered unsuitable by OWMC.
ii)	Thickness of Confining Layer	
	The "confining layer" refers to a continuous unit of fine-grained materials that effectively contains potential contaminants by retarding contaminant migration and effectively protecting underlying groundwater aquifers.	The thickness of the confining layer as it relates to the groundwater flow path can have a pronounced influence on the length of time necessary for a contaminant to move vertically through the soil layer. As the thickness of the confining layer increases, the travel time similarly increases. Soil units which are thick will provide relatively greater containment than units which are thin or of limited extent.
iii)	Geologic Predictability	
	The predictability of movement of contaminants in the subsurface is dictated by the geologic unit(s) which dominate the stratigraphic sequence in a given area.	In areas where the stratigraphy is variable and complex, groundwater and contaminant movement patterns can be expected to be intricate and complicated. Groundwater movement patterns are difficult to predict in such areas. Where the stratigraphy is dominated by uniformly textured soils which are continuous both laterally and vertically, groundwater and contaminant movement patterns are predictable. It is desirable for an OWMC facility to be located in an area where the stratigraphy is uniform and groundwater movement is predictable.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
iv) Material Texture	Material texture is dictated by the size of grains which constitute the soil materials.	The rate of groundwater and contaminant movement is influenced by the pore spaces between grains (permeability). In granular materials, which are highly permeable, groundwater and contaminant movement is potentially rapid. In fine-textured soils, which have low permeability, groundwater and contaminant movement is slow. Fine-textured soils effectively contain potential contaminants by retarding contaminant movement.
v) Oil and Gas Wells	All active, inactive and abandoned oil and gas wells are included.	The number and distribution of oil and gas wells may be a minor constraint to facility siting. Abandoned wells in particular could act as conduits allowing rapid movement of contaminants vertically in underlying aquifiers. This concern can be mitigated by plugging the wells and is basically a cost consideration.
1.2.2 Biology		
i) Woodlots	The following wooded units were considered in descending order of significance: SEUs, non-SEUs greater than 20 ha and other woodlands less than 20 ha in area. The level of significance assigned to woodlots was primarily based on areal extent of the tract and whether it had been assigned any significance during studies by other workers.	Wooded tracts are considered to be of value since their distribution in Southern Ontario is generally limited. Also, woodlots may possess economic and recreational value, perform ecological functions and provide habitat for uncommon species. Sites which did not infringe upon SEUs and which had few wooded areas were preferred over sites containing SEUs or large wooded areas.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
ii)	Wildlife Habitat	
	A subjective evaluation of wildlife habitat conditions on each site was made from field observation and aerial photo interpretation.	Generally, the degree of aquatic and terrestrial habitat diversity and amount of wooded cover present determine the significance for wildlife habitat. For example, significance was assigned to sites having large woodland blocks especially if aquatic habitat and other vegetation communities were present on site. Sites with limited natural vegetation cover and aquatic habitat consisting of drainage ditches with intermittent flow or manicured ponds would be expected to have little habitat value for wildlife.
iii)	Surface Water	
	Surface water includes any permanent or intermittent creeks, streams, ponds or drainage channels, or wetlands found on site or in proximity to the site.	The type, permanence and areal extent of water courses and water bodies was determined since these influence habitat value for fish and wildlife and the potential for other uses.
iv)	Local Setting	
	The local biological setting of sites was assessed taking into account vegetation cover patterns and adjacent land use patterns. Major natural vegetation and aquatic systems which extended onto sites from adjacent lands were identified. Adjacent SEUs and non-SEU woodlots greater than 20 hectares were also highlighted.	Major natural vegetation and aquatic systems which extend onto sites from adjacent lands may provide valuable habitat and function as part of a biological system or travel corridor.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
1.2.3 Atmospheric Dispersion	
An overall index of potential atmospheric dispersion constraint was derived based on an evaluation of topography, existing air quality and existing sources.	Sites with potential atmospheric dispersion constraints were noted and will be subject to further analysis in the detailed comparative evaluation.
1.3 COSTS/OPERATIONS	
1.3.1 Land Acquisiton	
i) Land Value	
This indicator represents the estimated land value for site lands.	As a public agency responsible for the expenditure of public funds it is a responsibility of OWMC to minimize, where feasible, expenditures. Sites with lower land values would generally be viewed somewhat more favourably than sites with high land values, all other factors being equal.
ii) Land Fragmentation	
Land fragmentation is the division of land into increasingly smaller property holdings. The degree of fragmentation can be measured by the average parcel size or the number or parcels per standard site area.	The higher the degree of fragmentation of the site, the larger the number of owners with which OWMC will have to deal, and therefore the greater the impact on land owners and the greater the degree of difficulty in assembling the sites.
iii) Land Ownership	
The property boundaries of all land parcels for all sites were compiled. A distinction was made between lands under private ownership and under public ownership.	Location of an OWMC facility on publicly-owned land would involve less acquisition of land in private ownership.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
1.3.2	Site Improvements	
i)	Landform	
	Landform refers to the physiographic unit to which the site belongs. Examples include lacustrine plain and till plain.	Each landform has associated soil characteristics which could influence operations and design in a minor way. Lacustrine plains, for example, generally are composed of deep clay soils which could present wet weather operational problems and foundation design considerations. Till plain soils on the other hand are denser and better founding material and are slightly less susceptable to wet weather operational problems. Engineering and operational measures can mitigate these concerns.
ii)	Topography	
	Topography refers to the general relief or slope of the site.	Gently rolling topography is generally favoured for the location of waste management facilities. Sites with relatively level topography may have potential drainage problems and sites with severe slopes may present problems with erosion. Engineering measures could mitigate these concerns.
iii)	Surface Drainage	
	Surface depressions (swales) with little or no developed drainage pattern may contain shallow organic soils and may hold water for most of the year. These depressional areas may have high water table conditions and usually support the growth of wetland type plants.	The individual wetland features found within this area are not of high significance to the location and construction of facilities. They may require drainage and other engineering works (i.e. excavation and filling) but may also require remedial measures to control potential adverse effects of site drainage. Poor foundation

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
	materials, the presence of saturated soils or flooding conditions, and the possibility of movement of potential contaminants within the wetland areas are the major items to contend with when considering these areas for siting facilities.
1.3.3 Utilities, Roads, Airports	
i) Utility Transmission Lines Re-Routing	
The type and length of utility transmission lines (hydro, gas, oil, Bell) traversing each site or along roads running through the site were noted.	Utility transmission lines are frequently located within their own exclusive or shared rights- of-way. Disruption to these as a result of facility site selection could have significant cost implications for the Corporation.
ii) Road Closure Required	
For site selection purposes, the only road closures considered involved local access routes.	Fully integrated or partially integrated landfill sites require the assembly of a large block of land.
Sites requiring the closure of provincial or regional arterial routes were discarded as such road closures were considered exclusionary.	Due to the state of development within a substantial part of the candidate area, few large parcels of land exist that are adequate to satisfy this need for one large parcel. Consequently, to assemble the required land area the closing of roadways would be required in certain instances. This requirement could affect local users of the route unless reasonable alternative routings exist.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
iii) Airport-Smokestack Conflict with Incinerator	Airports in proximity to candidate sites could be affected by construction of OWMC facilities. The flight paths over the ground approach to these airfields could be in conflict with the physical structures required on an OWMC site(s), particularly the incinerator stack. This in turn may affect the airport license and/or operation.	Obstacle control protection exists at Pearson International, Hamilton Civic and St. Catharines Airports as defined by Transport Canada Regulations. This regulation prohibits vertical obstructions exceeding 45 metres within a radius of 4000 metres from a theoretical reference point(s) at each airport. OWMC facilities may be restricted in terms of facility location or the height of the incinerator stack.
1.3.4 Site Size and Configuration		
i) Total Area	The total site area in acres was calculated.	Sites of adequate overall size but abnormal shape were checked in terms of any operational difficulties associated with locating the facility on that site. As site size and configuration was a factor during the site screening it was generally only a minor consideration during initial comparative evaluation.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
2. Factors in Site Vicinity	
2.1 HUMAN ENVIRONMENT	
2.1.1 Existing Residents	
i) Number of People	
This indicator is an estimate of the number of people who reside and work within the site vicinity and who may be affected if a facility were located there.	Potential conflicts with residents in proximity to an OWMC facility are undesirable. Those sites with fewer people within the site vicinity were seen as more desirable than sites with large numbers of people in the site vicinity.
ii) Number of Residences	
The number of residences is the number of housing units, both farm and non-farm related.	Number of residences is the most easily measured indicator of the amount of personal dislocation or residential exposure to be anticipated in the event of facility location in the area.
2.1.2 Existing Resources	
i) Existing Farm Infrastructure	
Farm infrastructure refers to the complex of farm buildings, i.e. barns, storage sheds, silos, grain bins, manure storage, etc. The total number of farm buildings rated average or above average on lands within 500 m or 1000 m of the site were recorded.	The nature, size and condition of farm building complexes is indicative of the relative value of farm infrastructure that would be impacted by the siting of an OWMC facility. The characteristics of such facilities are also indicative of the relative strength of existing agricultural activity adjacent to the sites. Impacts will generally be greater in areas with a higher infrastructure investment.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
ii)	Value of Sensitive Crops	
	Agricultural crops which are considered potentially sensitive to fugitive emissions from an incinerator were identified within a 5 km radius of the incinerator site.	The potential impact on sensitive crops may result in loss of revenue. Site vicinities with few or no land areas devoted to sensitive crops are more desirable than areas of intensive sensitive crop cultivation.
iii)	Density of Livestock	
	The population of livestock and poultry per 100 acres of farmland within a 5 km radius of incinerator sites was estimated.	This indicator relates to risk to human health via the food chain and to economic impacts to farm operations, in the event that livestock ingest food which has been affected by incinerator emissions. Low population densities are desired.
2.1.3	Existing Community and Recreation Facilities	
i)	Public Community Facilities	
	Those facilities under public jurisdiction and which provide educational, health and safety, correctional and government services to a municipality are included in this category. Examples include schools, police and fire stations.	These facilities may contain temporary or residential populations, some incapacitated and are generally not compatible with the industrial nature of OWMC facilities. In many cases these facilities would be difficult to relocate.
ii)	Public Recreational Facilities	
	These facilities include those under public jurisdiction which provide recreational and leisure	These facilities could involve a large number of temporary users or in some cases tourists. The potential for loss

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
	opportunities for residents. Facilities such as parks, fairgrounds, museums, community and cultural centres were considered in this category.	of recreational opportunities, disruption to use of the facilities or the loss of revenue are undesirable. Such facilities would not generally be considered compatible with industrial uses.
iii)	Private Community Facilities	
	Those facilities under private jurisdiction and which provide educational, commercial and health services to a community. Examples include churches, homes for the aged, special educational facilities, nursing homes and shopping centres.	These facilities may contain temporary or residential populations, some incapacitated and are generally not compatible with the industrial nature of OWMC facilities. In other cases, these facilities provide essential services to the community. Generally, most of these facilities would be difficult to relocate.
iv)	Private Recreational Facilities	
	These facilities include those under private ownership and operation which provide recreational and leisure opportunities for community residents. Private facilities such as museums, sports complexes, golf courses and arenas were considered in this category.	These facilities could involve a large number of temporary users or in some cases tourists. The potential for loss of recreational opportunities, disruption to use of the facilities or the loss of revenue are undesirable. Such facilities would not generally be considered compatible with industrial uses.
v)	Known Archaeological and Historical Sites	
	This would include sites and buildings of known historical significance, such as houses, farms, mills, factories, stores and shops. The number and	It is important to identify known archaeological and historical sites as they may have some broad social and cultural relevance and need to be protected. The application of

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
	significance of known native (pre 1650) archaeological sites and Euro-Canadian (pre 1867; non-standing) historic sites were recorded.	mitigative measures to preserve these sites or the consideration of site relocation must be examined.
2.1.4	Existing Community Character and Lifestyle	
i)	Land Use Pattern	
	Land use pattern refers to the overall mix of land uses within the vicinity of candidate sites.	Such a factor will provide an indication of land use compatibility or conflicts in the area, the general character of the community and the development potential of certain land parcels.
ii)	Social and Economic Character	
	Heavy industrial areas, urban fringe industrial areas, emerging industrial areas in proximity to residential and rural areas, rural residential urban fringe areas and urban transition areas and rural areas. An overall general classification of the sites was identified in order to convey a general impression of social and economic character. A key element in the classification was whether the sites were within areas characterized by comparable medium to heavy industrial uses.	The location of OWMC facilities in close proximity to an industrial area was considered more compatible than location in rural areas.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
iii)	Urban Shadow	
	Areas located on the fringe of urban municipalities which have in the past and/or in present been subject to strong pressure of urbanization such as land speculation, severances of large farm holdings into small lots, introduction of rural non-farm residences, conversion of commercial farms to hobby farms, etc.	Relative to agricultural lands in areas remote from such pressures, these areas have lower potential as long-term commercial farming areas. Such areas may have potential for the siting of OWMC facilities.
2.1.5	Future Residents	
i)	Projected Population Levels	
	An estimate of projected population levels can be derived through an examination of Official Plan policies and future land use designations and specific development proposals. This gives an indication of potential population levels in the vicinity of each site.	OWMC facilities are industrial in nature and as such are characterized by noise and rail and truck traffic. Such facilities are generally not compatible with populated areas.
ii)	Approved Residential Plans of Subdivision	
	These include plans for residential subdivisions that have municipal or provincial approval and that will be built at some point in the future.	OWMC facilities are not compatible with residential built-up areas. Approved plans indicate a commitment for development.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
iii)	Residential Land Use Designations	
	Lands which have been approved by municipal Official Plans for residential uses, which may or may not be presently developed. In some cases lands have been designated by municipal Official Plans for future residential uses, however, are at present vacant.	The OWMC facilities, except for the landfill, are essentially industrial in nature. Residential uses would not generally be considered compatible with industrial uses.
iv)	Residential Zoning	
	This include lands that have been zoned for residential uses in municipal zoning by-laws.	The OWMC facilities, except for the landfill, are essentially industrial in nature. Residential uses would not generally be considered compatible with industrial uses.
v)	Residential Development Proposals	
	This indicator includes applications for planning approval of development including Official Plan amendments, draft plans of subdivision rezoning applications which are pending with the relevant area municipality, regional municipality, or are awaiting approval or decision by the Minister of Municipal Affairs and Housing or the Ontario Municipal Board.	Any proposals for future residential development will generally be in proximity to existing residential uses. The location of an industrial facility in an area with potential for residential development is undesirable.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
2.1.6	Future Resources	
i)	Soil Capability Class	
	The predominant soil capability class within a 1 km radius of the site was identified. The soil capability indicates the relative potential of the soil resource base to produce common field crops on a sustained basis.	This indicates the general potential for agriculture in the site vicinity. The higher the capability class, the higher the yield potential for common field crops.
ii)	Rural/Agricultural Land Use Designation	
	Official Plan designations in the site vicinity are an indication of the community's intentions in the short to medium term future for agricultural land uses.	Only lands which are designated rural or agricultural have any long term opportunity to realize the potential of the land resource base for agriculture. This designation is generally intended to conserve agricultural resources.
2.1.7	Existing Commercial and Industrial Uses	
i)	Commercial Facilities	
	The number and type of existing commercial uses including shopping centres, offices and personal service uses were considered.	Most commercial activities would not generally be considered compatible with heavy industrial uses. Capital investment in commercial areas is generally intensive. The potential closure of small businesses is a concern.
ii)	Industrial Facilities	
	The number and type of existing light and heavy industrial uses were considered. Industrial uses are generally characterized by noise, some airborne emissions, rail and truck traffic, etc.	The OWMC facilities, except for the landfill, are essentially industrial in character and will have a substantial degree of compatibility with many of the existing industrial areas.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
		Built-up industrial areas contain a variety of industrial and related buildings and uses. The existence of industrial uses in the site vicinity may be compatible with an OWMC facility.
2.1.8	Future Commercial and Industrial Uses	
i)	Planned and Proposed Commercial Facilities	
	This indicator includes planned and proposed commercial facilities including shopping centres, offices and personal service uses.	Most commercial activities would not generally be considered compatible with heavy industrial uses. Capital investment in commercial areas is generally intensive.
ii)	Planned and Proposed Industrial Facilities	
	This indicator includes planned and proposed industrial uses generally characterized by noise, some airborne emissions, rail and truck traffic, etc.	Planned and proposed industrial uses will generally be located well removed from residential uses. The OWMC facilities, except for the landfill, are essentially industrial in nature and as such may be suitably located in proximity to other industrial uses.
2.2	COSTS (OFF-SITE)/OPERATIONS	
i)	Proximity to Rail Access	
	All active or abandoned railway lines are included. Proximity of rail lines to potential OWMC facility sites is the indicator of rail service possibilities.	Availability of rail access to integrated treatment sites or to non-integrated physical/chemical-incinerator sites may be a positive locational factor for the haulage of

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
	untreated special wastes and/or the haulage of process reagents or additives for large bulk shipments.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
3. Access Roads - Local	
3.1 HUMAN ENVIRONMENT	
3.1.1 Transportation Safety	
i) Proximity to Arterial Road	
The distance between the site and the nearest arterial road was measured. Access to individual facility sites will require access over existing roads, the construction of a new roadway connection from the arterial system to the site boundary or direct access from the arterial road.	Where facilities flank an arterial road it is probable that direct access can be provided to the site. However, in instances where the sites are remote from an arterial roadway, provision must be made for improvement of other existing collector or local service roads or the construction of a new roadway from the arterial system to the site boundary.
ii) Difficulty of Access	
Conditions such as level rail crossings or problems associated with local access routes can hinder ease of access to sites.	Those access routes with the fewest structural problems from a transportation point of view are more desirable and have a decreased level of risk associated with their use.
3.1.2 Existing Residents	
i) Number and Size of Population Concentrations	
This indicator refers to rural residential and rural estate strip development and to subdivisions, small villages and towns.	Sites with access routes passing through few or no population concentrations ranked as more acceptable in comparison to those passing through several and/or major population concentrations.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
ii)	Number of Residences	
	The number of residential units fronting local access roads, including residences and farm residences were considered.	Transportation impacts through areas with many residences include increased noise and truck traffic and a possible increased threat to safety. Access routes which have fewer abutting residences are more favourable than routes with many abutting residential uses.
iii)	Distance Through Residential Strip Development	
	This indicator is a measure of the actual distance trucks would travel through strip residential development along local access roads.	Impacts through residential strip development include increased noise and truck traffic and increased threat to safety. The potential risk as a result of possible spills must also be considered. Access routes passing through areas with little or no residential strip development are more desirable than areas of intense or continuous strip development.
3.1.3	Existing Resources	
i)	Number of Active Farm Complexes	
	Farm complexes include all farm buildings, such as barns, storage sheds, silos, grain bins, manure storage, etc.	The number of active farm complexes along access roads indicates the probable degree of conflict between truck movement and movement of farm machinery. The tendency should be to choose sites with access roads that have the fewest number of active farm complexes.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
ii)	Livestock Populations Along Access Roads	
	An estimate was made of the population of livestock and poultry within a 2 km wide band centred on the local access roads.	This provides a measure of the relative risk to livestock and the food chain due to spills of untreated material which through vapour or liquid movement from the spill site could affect the health and/or economic value of livestock.
3.1.4	Existing Community and Recreational Facilities	
i)	Community Facilities	
	Facilities under both private and public jurisdiction which provide educational, health and safety, correctional and government services to a municipality which fronted on access roads are included. Examples include schools, police and fire stations, hospitals, nursing homes and special educational facilities.	Impacts along access roads which have abutting community facilities include increased noise and possible conflicts with other vehicular traffic presently using these access routes (e.g. school buses). Increased traffic noise in quiet zones around hospitals or nursing homes is not desirable.
ii)	Recreational Facilities	
	Facilities under both public and private jurisdiction which provide recreational and leisure opportunities for residents are included. Facilities such as museums, sports complexes, golf courses, parks, fairgrounds and community and cultural centres are included in this category.	Increased truck traffic and noise may have an impact on the enjoyment derived from recreational and leisure facilities. In addition, increased truck traffic may lead to conflicts with other vehicular traffic presently gaining access to such facilities.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
3.1.5	Future Residents	
i)	Distance Through Residential Land Use Designations	
	This indicator represents the actual linear distance that local access roads pass through areas that have been designated for residential uses by municipal Official Plans. These designated areas may or may not be presently developed.	Residentially designated areas which are presently not developed represent areas of potential future development. Increased truck traffic and noise through residential areas is not desirable. Local access routes which pass through few or no areas with residential designations are preferable.
3.1.6	Future Resources	
i)	Length Across Class 1 Agricultural Equivalent Land	
	The length in miles of Class 1 equivalent land traversed by local access roads was measured.	This indicates the degree to which land resources potential may be lost if local roads must be widened to achieve acceptable standards for truck traffic.
3.1.7	Existing Commercial and Industrial Uses	
i)	Distance Through Commercial Areas	
	This indicator represents the distance local access roads pass through areas of existing commercial development. Commercial uses include shopping centres, offices and personal service uses.	Increased noise and truck traffic through commercial areas may lead to conflicts with vehicular traffic in the commercial area.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
ii)	Distance Through Industrial Areas	
	This indicator represents the distance local access roads pass through areas of existing industrial development. These industries may be light or heavy and are generally characterized by noise, some airborne emissions, rail and truck traffic, etc.	The OWMC facilities, except for the landfill, are essentially industrial in character and will have a substantial degree of compatibility with many of the existing industrial areas. Impacts associated with increased truck traffic through industrial areas will generally not be as great as routings through residential or commercial areas.
3.1.8	Future Commercial and Industrial Uses	
i)	Distance Through Designated Commercial Areas	
	This indicator measures the distance through which local access roads travel through designated commercial areas. Such areas are designated for future commercial uses in municipal Official Plans and may presently be developed or undeveloped.	Impacts associated with increased noise and truck traffic through commercial areas are undesirable. Disruption to local businesses or conflicts with existing vehicular traffic are potential concerns.
ii)	Distance Through Designated Industrial Areas	
	This indicator measures the disance through which local access roads travel through designated industrial areas. Such areas are designated for future industrial uses in municipal Official Plans and may presently be developed or undeveloped.	Impacts associated with increased noise and truck traffic through industrial areas will not be as great as increased traffic through residential or commercial areas.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
3.2 PHYSICAL AND BIOLOGICAL ENVIRONMENT	
3.2.1 Hydrogeology	
i) Length of Sensitive Lands Crossed	
The actual linear distance that local access roads cross over hydrogeologically sensitive lands was calculated. Such crossings would include crossings over surface aquifers.	The potential for contamination of surface groundwater aquifer through accidental spills of untreated wastes is of concern. Local access roads with fewer and shorter crossings over hydrogeologically sensitive uses (surface aquifers) were rated higher than routes with many or lengthy crossings over sensitive uses.
3.2.2 Stream Crossings	
i) Number of Stream Crossings	
The number of crossings over permanent or intermittent streams with sensitive uses, permanent streams with no known uses or intermittent streams were recorded. Water use based on information on file at the time of initial comparative evaluation was noted.	The potential for accidental spills into watercourses is a consideration especially if there are sensitive uses downstream.
3.2.3 Atmospheric Dispersion	
A general indication of atmospheric dispersion constraints was derived based on an evaluation of topography, existing air quality and existing sources.	Access routes with potential atmospheric dispersion constraints were noted and will be subject to further analysis in the detailed comparative evaluation stage.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
4. Access Roads - Regional	
4.1 HUMAN ENVIRONMENT	
4.1.1 Transportation Safety	
i) Transportation Accident Frequency Index	
The combination of this indicator with the average annual accident rate by road classification produces a value which can be compared between sites to produce an index of relative accident frequency.	The transportation accident frequency index is a surrogate value for accident risk. Those access routings with lower accident frequency indices are more desirable from a transportation perspective than those routings which exhibit higher accident frequency indices.
ii) Proximity to Freeways	
The location of OWMC facilities, in reasonably close proximity to freeways, is viewed to be a desirable attribute.	The impact of road transportation to and from OWMC facilities and in relation to local communities and populations, would generally be minimized where sites are close to freeway systems and arterial road interchanges with the freeway.
4.1.2 Existing Residents	
i) Distance Through Strip Residential Development	
This indicator is a measure of the actual distance trucks would travel through strip residential development along regional access roads.	Impacts through low to high density strip development include increased noise and truck traffic and an increased threat to safety. The potential risk as a result of possible spills must also be considered. Access

TABLE A5.5

Initial Comparative Evaluation Factors - Definition and Significance

FACTOR DEFINITION	SIGNIFICANCE
	routes passing through areas with little or no residential strip development are more desirable than areas of intense or continuous strip development.
ii) Number of Communities by Population	
This indicator refers specifically to the number of organized communities through which designated regional access routes pass. The approximate population of these communities was also noted.	Access routes were ranked according to the number of communities passed through. Access routes passing through few or no organized communities were given a higher ranking.
4.1.3 Existing Resources	
i) Number of Active Farm Complexes	
Farm complexes include all farm buildings such as barns, storage sheds, silos, grain bins, manure storage, etc.	The number of active farm complexes along the access road indicates the probable degree of conflict between truck movement and movement of farm machinery. The tendency should be to choose sites with access roads that have the fewest number of active farm complexes.
ii) Value of Sensitive Crops	
The estimated total value of sensitive crops within a 2 km band centred on the access road was determined.	This factor measures the relative risk to sensitive crops of untreated toxic wastes. Access routes which pass through areas where sensitive crops are not intensely grown are preferred.

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

	FACTOR DEFINITION	SIGNIFICANCE
iii) Livestock Populations	An estimate was made of the population of livestock and poultry within a 2 km wide band centred on the regional access road.	This provides a measure of the relative risk to livestock and the food chain due to spills of untreated materials which through vapour or liquid movement from the spill site could affect the health and/or economic value of livestock.
4.1.4 Existing Community and Recreational Facilities	Facilities under both private and public jurisdiction which provide educational, health and safety, correctional and government services to a municipality which front on access roads are included. Examples include schools, police and fire stations, hospitals, nursing homes and special educational facilities.	Impacts along access roads which have abutting community facilities include increased noise and possible conflicts with other vehicular traffic presently using those access routes (e.g. school buses). Increased traffic noise in quiet zones around hospitals or nursing homes is not desirable.
4.2 PHYSICAL AND BIOLOGICAL ENVIRONMENT		
4.2.1 Hydrogeology		
i) Crossing of Sensitive Lands	The actual linear distance that local access roads cross over hydrogeologically sensitive lands was calculated. Such crossings would include crossings over surface aquifers.	The potential for contamination of surface groundwater aquifer through accidental spills of untreated wastes is of concern. Regional access routes with few or no crossings over hydrogeologically sensitive uses (surface aquifers) were rated higher than routes

TABLE A5.5

Initial Comparative Evaluation Factors - Definitions and Significance

FACTOR DEFINITION	SIGNIFICANCE
	with many or frequent crossings over sensitive areas.
4.2.2 Stream Crossings	
i) Number of Stream Crossings	
The number of crossings over permanent or intermittent streams with sensitive uses, permanent streams with no known uses or intermittent streams were recorded. Water use based on information on file at the time of initial comparative evaluation was noted.	The potential for accidental spills of untreated wastes into watercourses is a consideration especially if there are sensitive water uses downstream. Those regional access routes with fewer crossings of rivers and streams are more desirable.
4.3 COSTS	
i) Tonne Kilometres of Waste and Solidification Agents Hauled	
Assuming road transport of special wastes and process additives by trucks, the distance travelled and total annual loadings from source sites to alternative receiver sites provides an indicator of transportation system efficiency and transport cost. The measurement used is tonne kilometres.	The tonne kilometre value obtained for each site is a surrogate for transport haulage cost. Those sites which exhibit lower tonne kilometre values are more desirable than sites with higher values.

TABLE A5.6 Comparative Evaluation of Siting Options (Integrated)

FACTOR	LF-10W	LF-11W	LF-1E
Biophysical (hydrogeology, hydrology, biology, air dispersion/ receptors)	° potentially constrained - hydrogeology ° major biological constraints - 2 small SEIs ° potential air receptor constraint - sensitive crops/ livestock	° potentially constrained - hydrogeology ° potential air receptor constraint - sensitive crops/ livestock ° minor biological constraint - wooded area	° air dispersion receptors - potentially moderate constr - pollution lev proximity to Niagara Falls ° potential air receptor constr - sensitive cro livestock ° hydrogeological suitability - t ° major biologica constraint - SE and other woode areas
Social (land use, economic, social, agriculture)	° agricultural area ° transport of partially treated wastes through agricultural area ° productive agricultural uses on site	° agricultural area ° transport of partially treated wastes through agricultural area ° century farm and historic homestead ° greater number of residences in close proximity ° potential archaeological constraint	° agricultural ar but subject to urban shadow influences ° transport of partially treate wastes through agricultural ar ° number of residences on si and in site vicinity
Transportation and Utilities	° good regional access - proximity to Highway 403	° good regional access - proximity to Highway 403 ° potential constraint Hamilton Civic Airport - requires further analysis	° long haulage ° quite direct acc to QEW
Costs	° low overall costs (land acquisition and transportation costs low)	° low overall costs (land acquisition and transportation costs low)	° moderately high costs (transportation costs high)

	LF-3E	LF-3C	LF-8C	LF-9C	LF-4N
	° severe constraint - hydrogeology (inadequate soil depth/sand layers) ° air dispersion - potentially moderate constraint - pollution levels, proximity to Niagara Falls ° SEUs on site and adjacent to site	° hydrogeological suitability - good ° potential air receptor constraint - sensitive crops/ livestock ° moderate biological constraint - wooded areas and Beaver Creek	° hydrogeological suitability - good ° potential air receptor constraint - sensitive crops/ livestock	° hydrogeological suitability - good ° potentially air receptor constraint - sensitive crops/ livestock	° hydrogeological suitability - fair ° potentially serious air dispersion constraint - proximity to Niagara Escarpment ° potential air receptor constraint - sensitive crops/ livestock
	° within urban shadow area - close proximity to industrial area ° Hungarian cultural centre	° agricultural area ° very lengthy transport through agricultural areas and through population concentrations ° Elcho United Church and cemetery on perimeter of site ° proximity to conservation area	° agricultural area ° least suitable of central integrated sites in terms of agricultural impacts ° lengthy transport through agricultural areas and through population concentrations	° agricultural area ° less suitable than LF-3C in terms of agricultural impacts but higher capability ° lengthy transport through agricultural areas and through population concentrations ° least number of residences on site	° agricultural area ° century farm ° number of residences on site and in site vicinity
	° long haulage ° adjacent to QEW	° very poor regional access; well removed from freeway system	° poor regional access - well removed from freeway system	° poor regional access - well removed from freeway system	° good regional access; short haulage distance ° potentially significant interference with local airport
	° moderately high costs (transportation costs high)	° moderate costs (transportation costs moderately high)	° moderate costs (transportation costs moderately high)	° moderate costs (transportation costs moderately high)	° low overall costs (transportation and land acquisition costs low)

TABLE A5-6 Comparative Evaluation of Siting Options (Partially Integrated)

FACTOR	LF-2N/PI-1A1	LF-2N/PI-1N	LF-4N/PI-1N	LF-1C/PI-1
Biophysical (hydrogeology, hydrology, biology, air dispersion/ receptors)	° potentially constrained hydrogeology ° PI-1A1 potential moderate to high air receptor constraint - proximity to populated areas	° potentially constrained hydrogeology (LF-2N), fair hydrogeology (PI-1N) ° potential moderate air receptor and dispersion constraint - proximity to populated areas and Niagara Escarpment ° potential air receptor constraint - sensitive crops/ livestock	° hydrogeological suitability - fair (4N), fair (1N) ° potential moderate air dispersion constraint (PI-1N) - proximity to Niagara Escarpment ° potential air receptor constraint - sensitive crops/ livestock	° LF-1C hydrog logical suitability good ° LF-1BE hydro logical suitability fair ° potentially moderate air dispersion/ receptor constraint - topography, proximity to populated ar pollution le ° LF-1C potent major draina constraint
Social (land use, economic, social, agriculture)	° both sites industrially designated (LF-2N proposed industrial) - light to medium rather than heavy industrial ° potential conflict with light industrial uses ° residences and private recreational uses in site vicinity ° LF-2N - small industrial/ commerical/public uses on site ° PI-1A1 potential conflict with existing and future residential uses	° LF-2N proposed industrial designation ° PI-1N - agricultural area but subject to urban shadow influences ° number of residences on site and in site vicinity ° LF-2N - small industrial/ commercial/public uses on site and in site vicinity	° agricultural areas but subject to urban shadow influence ° greater displacement of agricultural uses than integrated options ° century farm ° a greater number of residences on site and in site vicinity	° LF-1C - prop industrial designation ° PI-1BE - hea industrial designation ° PI-1BE - gre number of residences i site vicinit
Transportation and Utilities	° good regional access; short haulage distance ° LF-2N - transmission line crosses portions of site ° PI-1A1 - remote possibility - airport constraint	° good regional access; short haulage distance ° transmission line crosses portion of LF-2N ° potential interference with local airport	° good regional access; short haulage distance ° PI-1N - potential interference with local airport	° very poor regional acce well removed freeway syste
Costs	° very high overall costs (very high land acquisition; transportation costs low)	° overall costs low (high land acquisition costs - LF-2N; transportation costs moderately high)	° moderately low overall costs (low transportation costs)	° overall costs moderately hi (high transportatio costs)

8E	LF-10W/PI-2W	LF-11W/PI-2W	LF-1E/PI-27E	LF-4N/PI-13N	LF-2N/PI-13N
geo- - ogeo- - eas, vels ially ge	• potentially constrained hydrogeology - both sites • PI-2W potentially moderate air dispersion/ receptor constraint - proximity to populated areas/ topography • biological constraint - SEUs present on both sites	• potentially constrained hydrogeology - both sites • PI-2W moderate air dispersion/ receptor constraint - proximity to populated areas/topography • major biological constraint - SEU associated with PI-2W	• LF-1E, PI-27E - hydrogeological suitability - fair • air dispersion/ receptor potentially moderate constraint, pollution levels and populated areas • LF-1E major biological constraint - SEU and other wooded areas	• hydrogeological suitability - fair (LF-4N) • PI-13N - potential constrained hydrogeology • PI-13N - minor air receptor constraint - proximity to populated area • potential air receptor constraint - sensitive crops/ livestock	• potentially constrained hydrogeology - LF-2N and PI-13N • PI-13N minor air receptor constraint - proximity to populated areas • potential air receptor constraint - sensitive crops/ livestock
osed vy ater	• LF-10W - agricultural area • minimizes transport of partially treated wastes through agricultural areas • PI-2W - industrially designated • LF-10W - productive agricultural uses on site	• LF-11W - agricultural area • minimizes transport of partially treated waste through agricultural areas • PI-2W - industrially designated (in part) • LF-11W - greater number of residences on site and in close proximity • LF-11W - historic homestead and century farm	• PI-27E - proposed industrial designation • LF-1E - agricultural areas but subject to urban shadow influences • minimizes transport of partially treated wastes through agricultural areas • PI-27E - existing industrial uses on site • LF-1E - number of residences in site vicinity • potential archaeological constraint	• LF-4N/PI-13N - agricultural area - high capability • PI-13N - largely publicly owned • LF-4N/PI-13N - residences on site, in site vicinity and along access routes	• PI-13N - agricultural area - high capability • PI-13N - largely publicly owned • LF-2N - proposed industrial designation (special study area) • PI-13N residences on site and in site vicinity • LF-2N - potential conflict with light to medium industrial uses • LF-2N - small industrial/ commercial/public uses on site - private recreational uses in vicinity
ss; from m	• fairly good regional access; proximity to 403 • proximity to Hamilton Civic Airport - stack less than 90 m	• good regional access; proximity to Highway 403 • proximity to Hamilton Civic Airport - stack less than 90 m	• long haulage costs • adjacent to QEW	• good regional access; short haulage distance	• good regional access; short haulage distance
- gh n	• low overall costs (land acquisition and transportation costs low)	• low overall costs (low land acquisition and transportation costs)	• overall costs - moderately high (transportation costs high)	• low overall costs (transportation and land acquisition)	• moderately high overall cost; high land acquisition costs (LF-2N) • low transportation costs

CONCLUSION

The preceding lists, text and tables supplement the OWMC Phase 3 Report. In addition to this information, OWMC is preparing a number of technical reports which will further detail the information and methodologies the Corporation has used in the selection of candidate sites. The technical reports will be placed in the information deposits listed in the appendix for Chapter 2 and will be available from OWMC.

POOR

QUALITY

ORIGINAL